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MECHANICAL TESTS OF SOME COMMERCIAL PHILIPPINE TIMBERS [1]

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ONE PLATE AND NINETEEN TEXT FIGURES

A general knowledge of the mechanical properties of different woods is essential to the safe and economical use of timbers for any structural purpose.

This preliminary paper, on the mechanical tests of Philippine woods being conducted by the Bureau of Science with the cooperation of the Bureau of Forestry, gives data which will serve as a basis for the comparison of species as well as for the establishment of working stresses. The results given should also be of use in determining proper factors of safety in connection with the design of timber structures, and in studying the relation of the physical characteristics and defects of timber to its strength.

The tests made may be divided into two general series: namely, tests of structural timbers, and standard tests of small specimens free from defects.

MATERIAL TESTED

It is universally agreed that the fundamental qualities of timber for structural purposes are strength and durability, but the availability of wood in the sizes required and the cost of the material often determine what kind of timber should be used in

[1] These tests were started by Mr. F. R. Ycasiano with the coöperation of the writer, and later, when Mr. Ycasiano left the Bureau of Science, the writer performed the rest of the tests.

any specific case. Ordinarily not only will native wood found in the local market serve the purpose of the engineer, but it can be secured in better grades and at lower prices. In such cases the local material will very likely be used, provided reliable information regarding its properties is available. Without such information, however, the tendency of the builder is to use imported wood whose mechanical properties are known to him.

SMALL CLEAR SPECIMENS USED

Small clear specimens are used in the tests in order that consideration of the influence of defects may be eliminated from calculations to determine the relation between strength and density, moisture, locality of growth, etc. These various relations are not referred to in a specific way in the present publication, on account of the very small number of timbers available for tests. The specimens are 2 by 2 inches in cross section. Bending specimens are 30 inches long; others shorter, depending on the kind of test made.

The materials first tested came from the local market, and the rest, which were botanically determined, came from the Bureau of Forestry. Mr. E. E. Schneider, wood expert, Philippine Bureau of Forestry, kindly furnished the descriptions of the woods.

TENSILE STRENGTH

Timber used in construction is practically never subjected to pure tensile stress, for the reason that the end connections cannot be so devised that they do not involve either shear along the grain or compression perpendicular to the grain. The resistance offered by any timber to compression across the grain, or shearing stress parallel with the grain, never amounts to more than a small fraction of the tensile strength, as shown by the tests. Therefore, the tensile strength of timber is not an important property except in so far as the tensile strength is involved in all cases of transverse loading. For reasons of economy in the erection of structures, iron and steel should be used in parts that are to be subjected to purely tensile stress.

TANGILE

Tangile [*Shorea polysperma* (Blanco) Merr.] is a very widely distributed and fairly abundant species. Foxworthy[2] estimates that it makes up about 7 per cent of the volume of the forests of the Islands. Botanical collections of tangile are re-

[2] Philippine Dipterocarpaceae, II, Philip. Journ. Sci. § C 13 (1918) 165.

ported from the following provinces and islands: Cagayan, Calayan, Isabela, Ilocos Norte, Pangasinan, Nueva Ecija, Bulacan, Zambales, Bataan, Laguna, Tayabas, Polillo, Camarines, Albay, Sorsogon, Marinduque, Samar, Leyte, Cebu, Mindoro, Negros, Capiz, Biliran, Basilan, Surigao, Cotabato, Davao. Commercial material from other regions indicates that probably the species occurs in some places where it has not yet been reported.

Tangile is a tall, straight tree, reaching a diameter of 1.60 meters or more and a clear length of 22 meters or more. The average diameter of merchantable trees in regions where the species is fairly abundant ranges between 75 and 100 centimeters.

Tangile is soft to moderately hard and light to moderately heavy; the sapwood is thin (2 to 5 centimeters), pale grayish brown, not quite sharply marked off from the heartwood; the heartwood is pale pinkish red to dark reddish brown; the grain is distinctly crossed, producing a broad, conspicuous ribbon when quarter-sawn; silver grain small, but distinct; texture somewhat denser than most other lauans and taking a glossier surface under a sharp plane; seasons well and is easy to work. Not durable in contact with ground or when severely exposed to weather, but rarely attacked by insects, except by termites.

Structure.—Pith rays fine, less conspicuous than in most other lauans; pores small to fairly large, less numerous than in other lauans, evenly scattered; soft tissue much scantier than in most other red lauans; resin rings frequent, distinct, but very irregular.

Tangile is used chiefly for all kinds of interior finish and furniture. It is one of the woods that have been exported to America under the name of Philippine mahogany and, when finished properly, closely resembles true mahogany.

The logs for the present test were collected, with botanical specimens, in the cutting area of the Cadwallader-Gibson Lumber Co., at Limay, Bataan Province.

APITONG

Apitong (*Dipterocarpus grandiflorus* Blanco) is a very widely distributed and abundant species. There are several species of the same genus, the wood of which is not practically distinguishable and which is sold as apitong. It is therefore not possible to give an estimate of the quantity furnished by each species. Foxworthy[3] estimates the total amount of apitong (including

[3] Philip. Journ. Sci. § C 13 (1918) 164.

under this name the product of all the species of *Dipterocarpus*) at 20 per cent of the volume of the commercial forests. Apitong (*Dipterocarpus grandiflorus*) has been reported from the following provinces and islands: Cagayan, Isabela, Ilocos Sur, Abra, Benguet, Pangasinan, Nueva Ecija, Zambales, Bataan, Bulacan, Rizal, Laguna, Tayabas, Camarines, Albay, Mindoro, Sibuyan, Capiz, Negros, Samar, Biliran, Palawan, Agusan, Misamis.

Apitong is a tall, straight tree, ranging up to 1.80 meters or more in diameter and up to 30 meters in clear length. The average diameter of merchantable trees is probably between 60 and 90 centimeters.

Apitong is moderately hard to hard, stiff and strong, and moderately heavy to heavy. The grayish or brownish sapwood is from 2 to 8 centimeters thick, not quite sharply marked off from the heartwood; the heartwood is light ashy red to reddish brown or dark brown; grain generally fairly straight or slightly crossed, often forming a very regular diagonal figure on the face of a plank; texture rather coarse and rough; strong odor of resin when fresh, noticeable even in old dry pieces when worked over; resin exudes from ends of logs and even old pieces when exposed to sun; harder to saw than most of the other, less resinous woods of the family, but not otherwise difficult to work. Durability not high when in contact with ground or severely exposed to weather, but not commonly attacked by boring beetles.

Structure.—Pith rays generally distinctly of two kinds, fine and moderately thick, one to four or five fine ones between every two thick ones; pores small to medium, oval, rarely partitioned, numerous, evenly scattered, often with whitish resin deposits; resin canals sometimes very few, sometimes very numerous, scattered or forming many and conspicuous incomplete rings; soft tissue very variable, in rather thin rings or in irregular patches about pores, and numerous, scattered, broken, ill-defined crosslines between rays; no growth rings.

Apitong is probably the most widely used general-construction wood in the Islands, being available in large quantities and fit for all uses where extreme durability is not absolutely required. Besides being used in ship, bridge, wharf, and house construction, it is also used for flooring, wagon beds, interior finish, and cheap and medium-grade furniture.

The logs for the present tests were collected, with botanical specimens, from the cutting area of the Cadwallader-Gibson Lumber Co., at Limay, Bataan Province, Luzon.

GUIJO

Guijo [*Shorea guiso* (Blanco) Blume] is a very widely distributed and fairly abundant species. Foxworthy [4] estimates that it makes up about 5 per cent of the volume of the forests. This figure includes probably the product of one or more undetermined species of *Shorea*, but undoubtedly the greater bulk of it is from the species named above. Botanical collections of guijo are reported from the following provinces and islands: Cagayan, Isabela, Bontoc, Ilocos Norte, Ilocos Sur, Abra, Union, Nueva Vizcaya, Nueva Ecija, Pangasinan, Tarlac, Zambales, Bataan, Pampanga, Bulacan, Rizal, Laguna, Batangas, Tayabas, Camarines, Albay, Sorsogon, Marinduque, Ticao, Mindoro, Masbate, Samar, Leyte, Negros, Capiz, Agusan, Misamis, Davao, Cotabato, Zamboanga.

Guijo is a tall, straight tree ranging up to 1.80 meters or more in diameter and up to about 30 meters in clear length. The average diameter of merchantable trees will probably run from 60 to 90 centimeters.

Guijo is moderately heavy to heavy, moderately hard to hard, tough, and difficult to split; the sapwood is thin (2 to 5 centimeters), light grayish brown, not sharply distinguished from the heartwood; the heartwood is light ashy brown to brown, sometimes with a distinct reddish tint; grain distinctly crossed; texture rather fine, taking a glossier surface, both in longitudinal and in cross sections, than apitong; has a faint odor of resin; seasons slowly and is liable to split and warp if not seasoned very carefully; not hard to saw, but on account of the crossed grain rather difficult to shape and surface. Not durable when in contact with ground or severely exposed to weather, but good under cover, being rarely attacked by insects, except termites.

Structure.—Pith rays fine, not conspicuous; pores rather small, scattered; soft tissue less abundant than in apitong, in thin, irregular rings about pores and in short, indistinct, tangential lines; resin rings frequent, narrow, distinct; growth rings sometimes faintly indicated in young trees; all the elements in guijo are smaller and more sharply defined than in apitong, so that the cross section has generally a cleaner look, so to speak, than in the latter.

Guijo is used for all kinds of general construction work where it is not severely exposed or where extreme durability is not absolutely required. It is preferred to apitong for practically

[4] Philip. Journ. Sci. § C 13 (1918) 165.

all uses, being stronger and tougher; for almost all parts of vehicles, it is probably the most widely used wood in the Islands.

The logs for the present test were purchased in the Manila market. There is practically no doubt that they were true guijo [*Shorea guiso* (Blanco) Blume].

LUMBAYAN

Lumbayan (*Tarrietia javanica* Blume) has been found only in Misamis, Cotabato, Zamboanga, and Basilan. It is estimated that it constitutes not over 5 per cent of the total stand in those regions where it occurs. Lumbayan is a tall, straight tree, reaching 40 to 50 meters in height and 130 centimeters in diameter.

The sapwood of lumbayan is very pale red merging rather gradually into the light red to reddish brown heartwood. The heartwood is moderately heavy, soft to moderately hard, straight or slightly cross-grained, fairly durable, being rarely attacked by insects, flexible and tough, rather easy to split, and easy to work. In color and texture it resembles the red lauans except that, when quarter-sawn, the silver grain is more conspicuous than in most lauans.

Structure.—Pith rays moderately thick, distinct, forming a small but conspicuous silver grain in radial sections and visible as minute vertical lines in tangential sections; pores few, moderately large to large, evenly scattered, sometimes with dark red, glistening deposits; soft tissue in smooth thin rings about pores; no growth rings.

Lumbayan is used for flooring, interior finish, furniture, ship planking, and ship cabin work.

The material for the present test was secured from the Bureau of Supply, having been purchased by that bureau from one of the large mills in Zamboanga.

GISOK (YAKAL)

The woods known in commerce as yakal are the product of *Isoptera borneensis* Scheff., and of several species of the genera *Hopea* and *Shorea*. The material used in the present test was commercial yakal from Zamboanga, identified as being practically without doubt of the species known as gisok [*Shorea balangeran* (Korth.) Dyer].

Gisok is a large tree, reaching a height of 35 to 45 meters and a diameter of 180 centimeters. It has been reported by botanical collectors from the following islands and provinces: Nueva Ecija, Pangasinan, Pampanga, Zambales, Tayabas, Ca-

marines, Albay, Samar, Leyte, Samal, Agusan, Zamboanga; but there is reason to believe, from commercial specimens, that it is more widely distributed than botanical collections made up to date would indicate. The amount of yakal in the Islands is estimated by Foxworthy [5] at 3 per cent of the total volume of the commercial forests; of this amount, gisok undoubtedly forms a very considerable share.

The sapwood of gisok is about 3 centimeters thick, light yellow when fresh, often staining in seasoning to a light yellowish gray; the heartwood when fresh is only slightly darker, gradually turning on exposure to a deep yellowish brown; it is very hard, very heavy, tough, and almost impossible to split in a radial direction, being strongly cross-grained. For a hard wood, it is not difficult to work, except that the crossed grain makes it difficult to plane radial sections. It is very durable, even when exposed to the weather or in contact with the ground, being destroyed very slowly by fungi and rarely attacked even by termites, but is poor in salt water, as teredos riddle it in a short time.

Structure.—Pith rays fine, numerous, distinct, light yellow, showing clearly against the background of brownish wood tissue; pores fairly numerous, scattered singly, rarely in groups of two or three, frequently with a tendency to form curved or oblique lines; soft tissue in rather thin rings about pores, sometimes confluent about groups or lines of pores but never forming continuous tangential bands; wood tissue very dense and homogeneous in appearance, occupying a very large proportion of the total area of the cross section and taking a glossy cut under a sharp tool.

Gisok (invariably sold and used under the name yakal) is used for all kinds of construction where great strength and durability are required, except for salt-water piling; for ax, peavey, and cant-hook handles, capstan bars, levers of all kinds; railroad ties; paving blocks.

RELATION OF PROPERTIES TO USES [6]

The most important strength values are: For large beams, modulus of rupture, modulus of elasticity, and shear; for long columns, modulus of elasticity and crushing strength in compres-

[5] Philip. Journ. Sci. § C 13 (1918) 166.

[6] For a more complete discussion see Bull. U. S. Dept. Agr. 556 (1917) 6, 7.

sion parallel to grain; for flooring and railroad ties the desirable properties are hardness and compression perpendicular to grain.

TESTING METHOD

A complete description of the testing method employed is given by the United States Forest Service.[7] A brief description of the different tests will aid the reader in attaching the proper significance to the results presented. The testing machines were calibrated before starting the tests. The formulæ used in calculating the different results contained in the tables will be found in the appendix.

BENDING TESTS

STRINGERS AND HEAVY JOISTS

Fig. 1 shows the apparatus used for bending tests on large beams. The testing machine is provided with an extension weighing platform. The beam is placed on two knife-edge supports, AA, which rest on this platform. The load is applied at

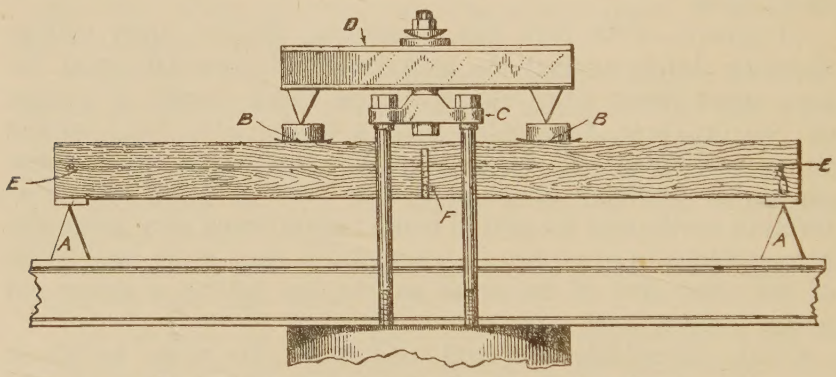

FIG. 1. Apparatus used for bending tests on large beams.

two points, BB, one-third as far apart as the distance between the knife-edge supports. As the head of the screw press, C, moves down, the straining beam, D, bears with increasing force on the specimen under test. As the load increases the beam deflects. A fine wire, EE, kept taut by a weight, is strung between two small nails driven midway between the top and bottom faces of the beam vertically above the knife-edge supports. This wire crosses the face of a scale, F, fastened to the beam midway be-

[7] Instructions to Engineers of Timber Tests, Circular (revised) U. S. Forest Service 38 (1909).

tween the supports. As the beam deflects, the scale moves down, while the wire does not change its original position. The distance the scale moves relative to the wire indicates the amount of deflection or bending. This method gives deflection to 0.01 inch, which is sufficiently accurate for tests on structural sizes. The load deformation readings are recorded as indicated in figs. 2 and 3, and the load at elastic limit is determined by drawing a straight line through the greatest possible number of points, the point at which the curve departs from the straight line being taken as the load at elastic limit. This method of locating the elastic limit is clearly indicated in the figures.

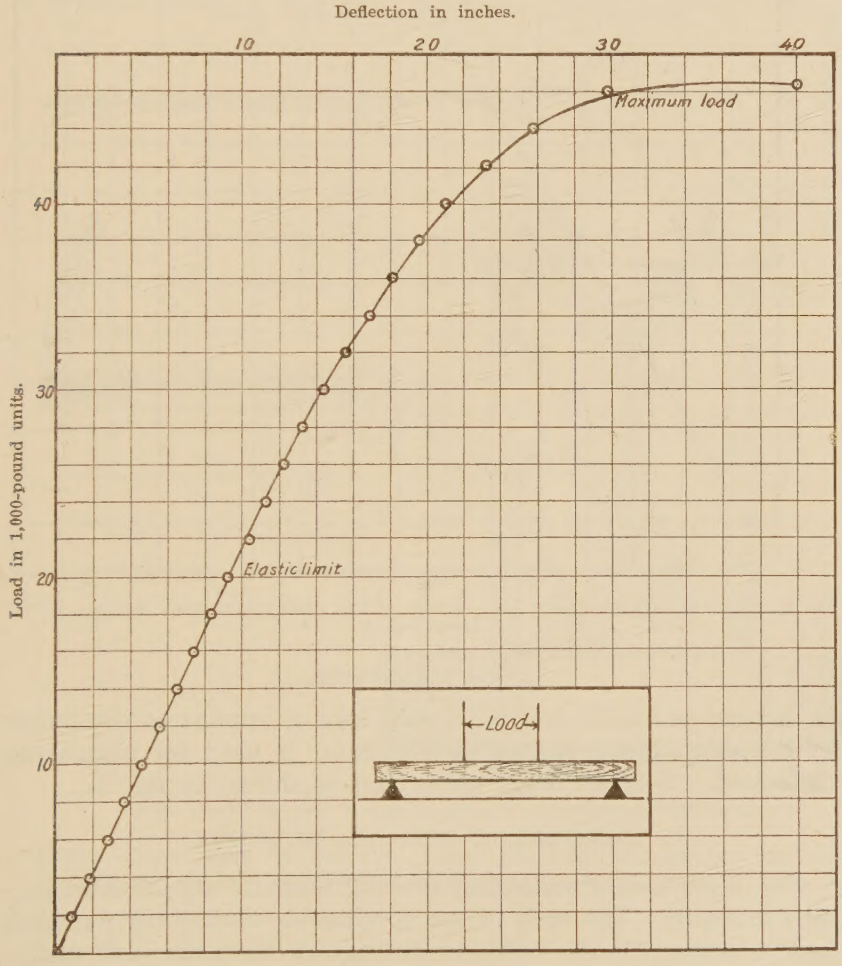

FIG. 2. Bending; 7.88 inches by 11.85 inches; 15-foot span; third-point loading; apitong.

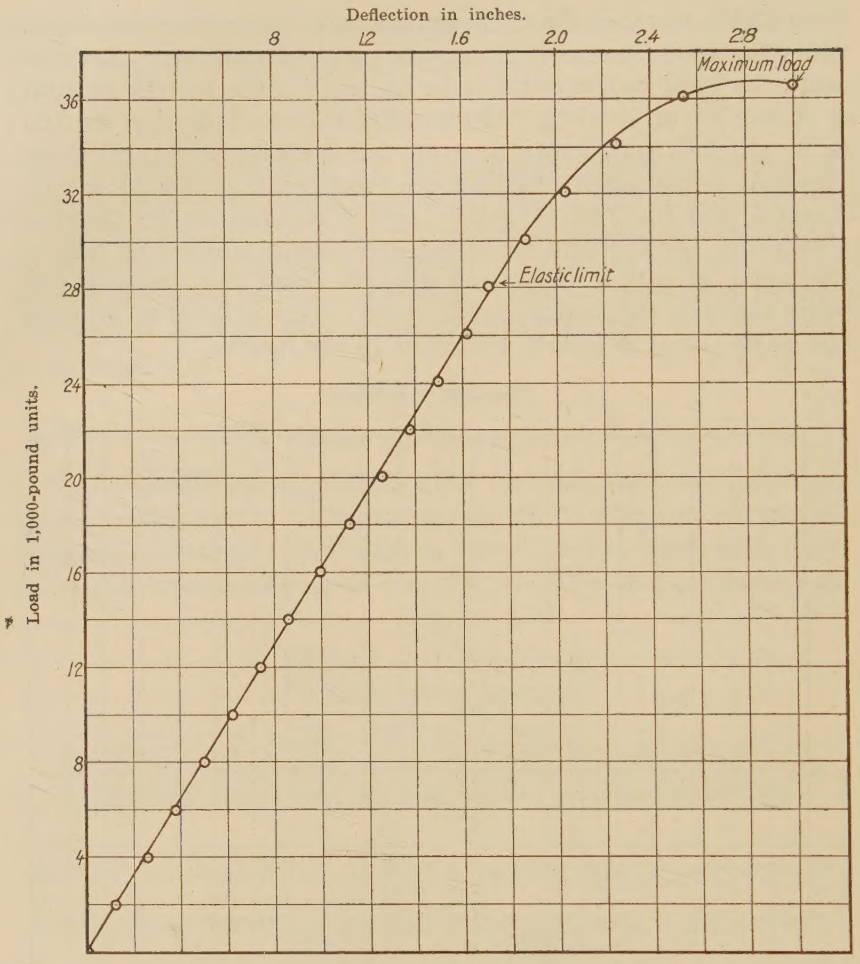

FIG. 3. Bending; 6.70 inches by 12.21 inches; 16-foot span; third-point loading; Borneo camphorwood.

SMALL CLEAR BEAMS

In tests on small clear beams the load is applied at the center of the span, and a special deflectometer is used for measuring deflection. A small beam under test is shown in fig. 4.

COMPRESSION PARALLEL TO GRAIN

Fig. 5 shows the method of making tests in compression parallel to grain. The ends of the specimen are carefully squared, and it is then placed, with the grain vertical to the base of the machine, upon a flat block having a spherical bearing, which

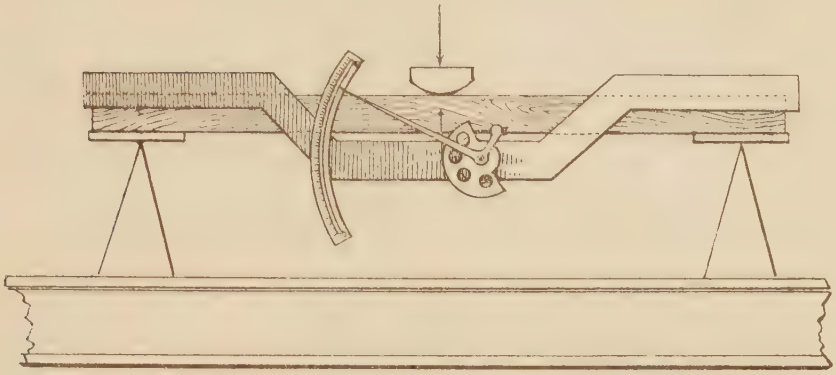

FIG. 4. Apparatus used for testing small clear beams.

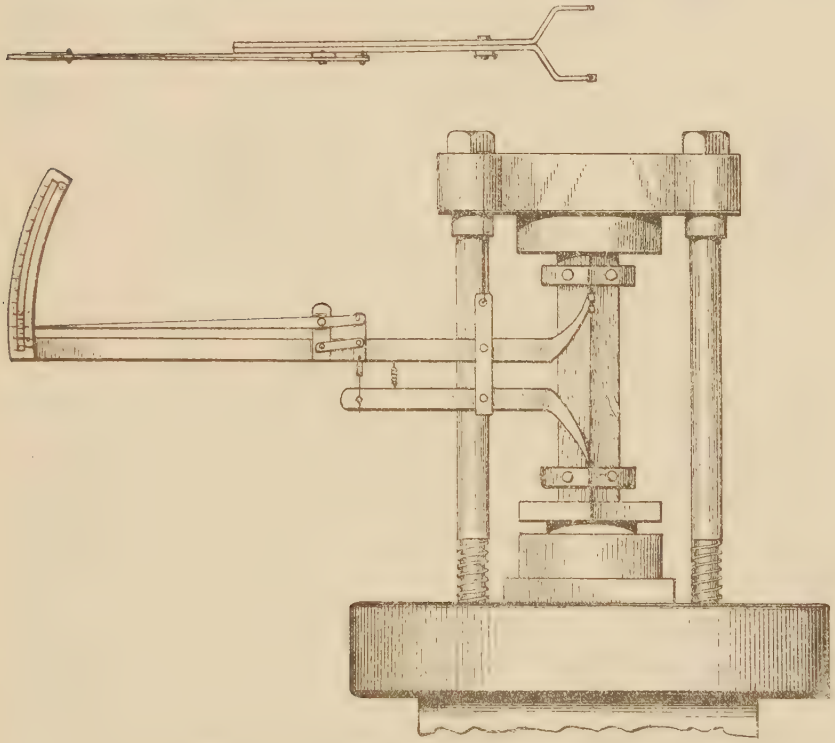

FIG. 5. Apparatus used in making tests of compression parallel to grain.

rests upon the weighing table of the machine. In tests where the modulus of elasticity is desired, two yokes, 6 inches apart, are placed on the specimen. The load is applied by moving the crosshead down very slowly. The decrease in length between the yokes is measured by means of a deflectometer which

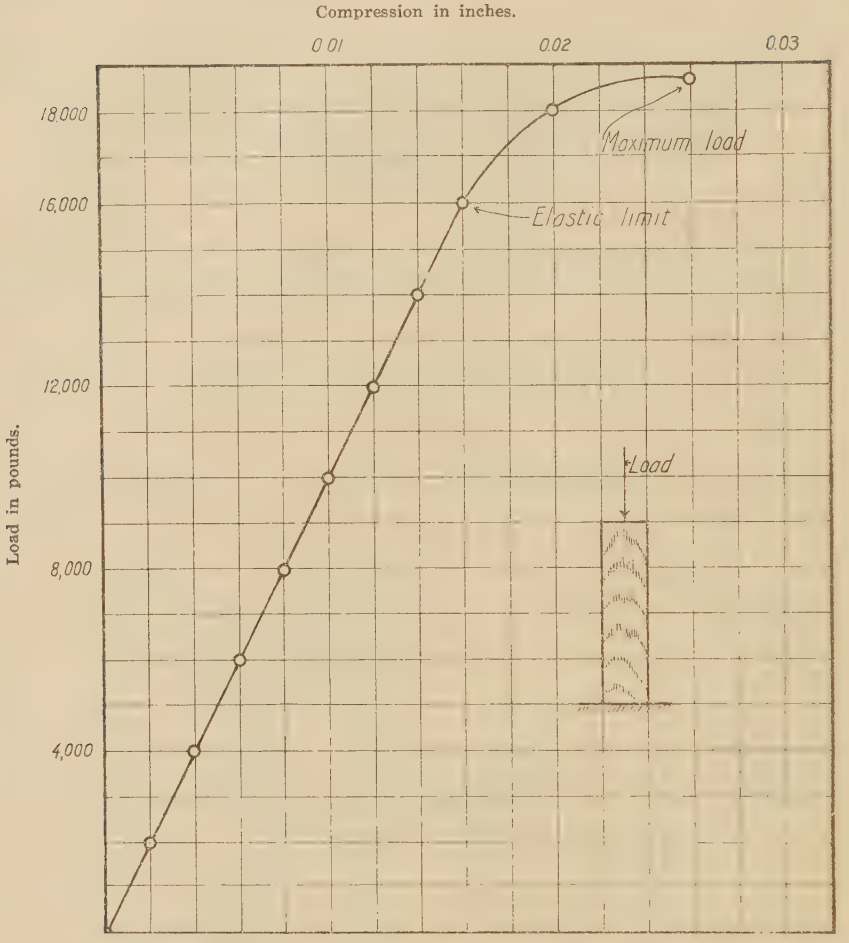

FIG. 6. Compression parallel to grain; stress area, 2 inches by 2 inches; height, 8 inches; apitong.

is clearly shown in the illustration. The readings given by the deflectometer are used in plotting the stress-strain diagram. Fig. 6 shows a typical diagram for tests in compression parallel to grain. The load at elastic limit is located in the same manner as that described for the tests of beams.

COMPRESSION PERPENDICULAR TO GRAIN

Fig. 7 shows the method of making tests in compression perpendicular to grain. In these tests the specimen is so placed that the grain is horizontal or parallel to the base of the machine. A steel plate, 2 inches wide, is adjusted on top of the specimen. The moving crosshead of the machine descends upon this plate,

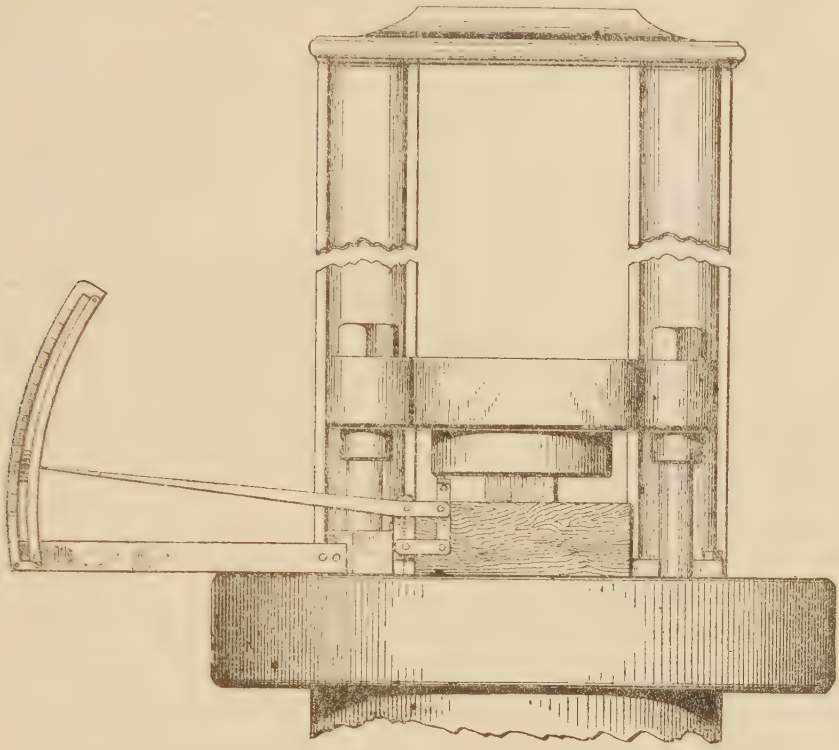

FIG. 7. Apparatus used in making tests in compression perpendicular to grain.

and the amount of deformation produced by a given load is indicated by the deflectometer. Fig. 8 shows a typical load deformation diagram for tests in compression perpendicular to grain. This diagram also shows the method of correcting deflections for loads below the load at elastic limit when the straight-line portion of the curve does not pass through the origin. The corrected deflections are used in calculating the modulus of elasticity.

SHEARING TESTS

The method of making shearing tests used is indicated in fig. 9. The block to the left shows the test specimen prepared with a projecting tongue which is to be sheared off parallel to the grain. The body of the block is held firmly in the shearing tool by means of set screws, the movable plunger bearing on the projecting tongue. When the specimen is in place the shearing tool is placed in the testing machine and the load is applied to the specimen by means of the plunger. The maximum load is the quantity desired in this test.

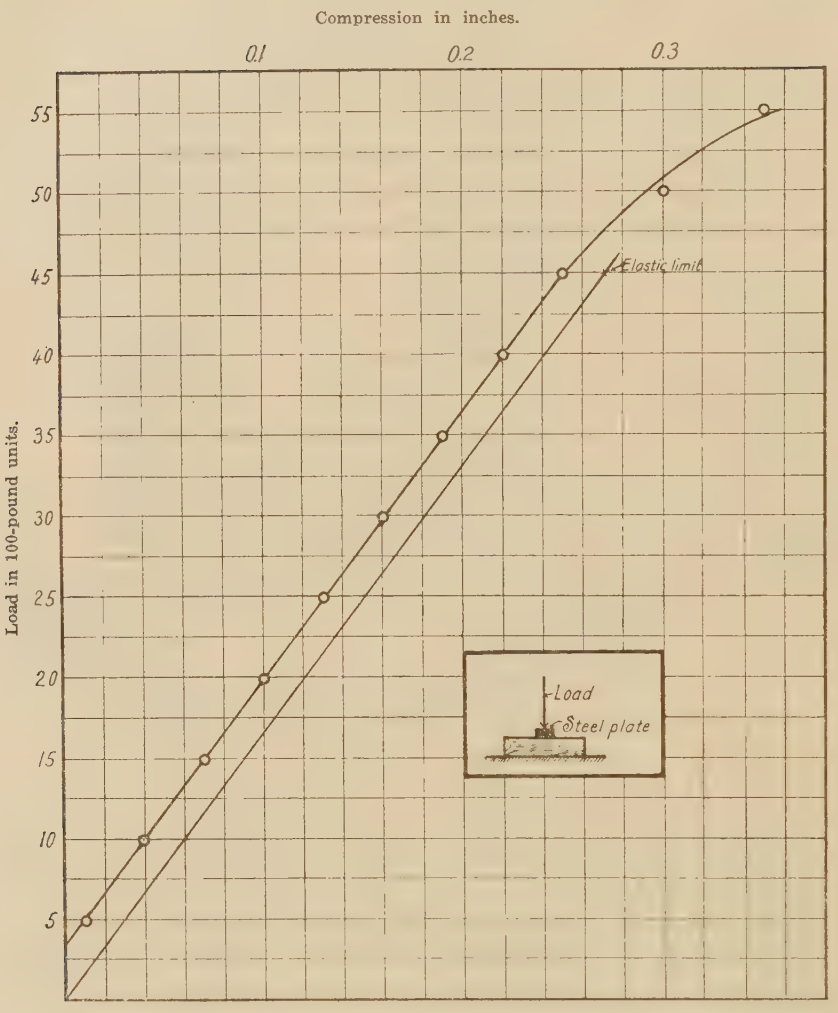

FIG. 8. Compression perpendicular to grain; stress area, 2 inches by 2 inches; lumbayan.

HARDNESS

Hardness is tested by measuring the load required to embed a 0.444-inch ball to one-half its diameter in the wood as shown in fig. 10.

The hardness test is applied to end and side surfaces of the timber. End hardness is usually greater than side hardness. The quality is important in woods to be used for paving blocks, railroad ties, furniture, flooring, etc.

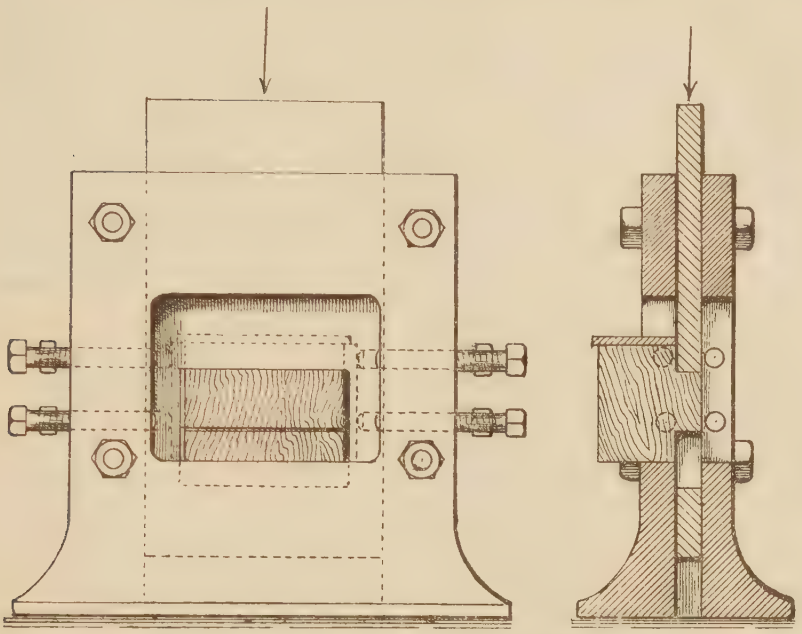

FIG. 9. Apparatus used in making shearing tests.

MOISTURE CONTENT

Tiemann [8] says:

Water exists in green wood in two forms: As liquid water contained in the cavities of the cells or pores, and as "imbibed" or hygroscopic water intimately absorbed in the substance of which the wood is composed. The removal of the free water from the holes or pores will evidently have no effect upon the physical properties or shrinkage of the wood, but as soon as any of the "imbibed" moisture is removed from the cell walls shrinkage begins to take place and other changes occur. The strength also begins to increase at this time. The point where the cell walls, or wood substance, become saturated is called the "fiber saturation point," * * * The fiber saturation point lies between moisture condition of 25 and 30 per cent, of the dry weight of the wood, depending on the species. * * *

Air-dried wood will rarely dry below 12 to 14 per cent.

Moisture content is the weight of water contained in the wood, expressed in per cent of the oven-dry weight of the wood. It is determined by weighing a small section of the test specimen and then drying it at 100° C. in an electric furnace until its weight becomes constant; the loss of weight is then divided by

[8] Journ. Franklin Inst. 188 (1919) 27–50.

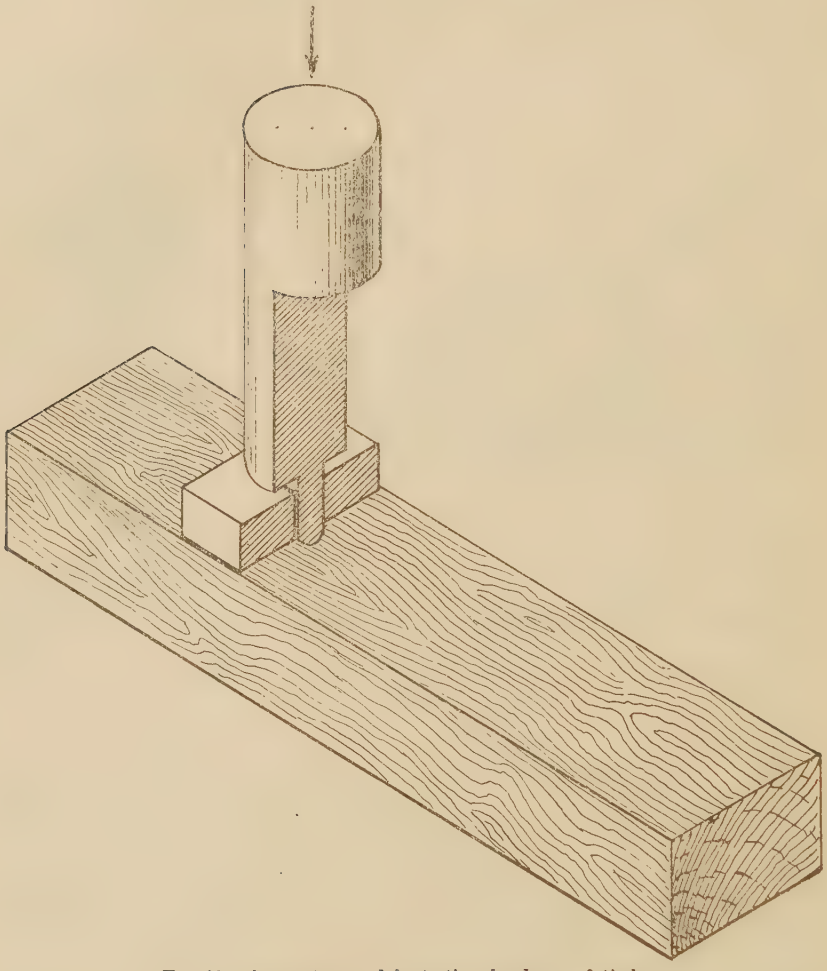

FIG. 10. Apparatus used in testing hardness of timber.

the dry weight, to give the proportion of moisture, and this is usually expressed in per cent of the dry weight.

SPECIFIC GRAVITY

Specific gravity is the weight of any given substance divided by the weight of an equal volume of pure water at its greatest density.

VARIABILITY IN THE STRENGTH OF TIMBER

The mechanical properties of the woods tested were found to vary greatly, not only of the specimens from different trees of the same species, but also of those cut from different portions

of the same tree. This is largely due to the defects they contained, and to the fact that they are not so homogeneous as are manufactured materials such as steel and other metals. The mechanical properties of a certain timber of a given variety can, therefore, be predicated upon the results obtained in tests of timber of that variety in a most general way only, until detailed information is obtained concerning the many factors governing the mechanical properties of both test timber and commercial timber.

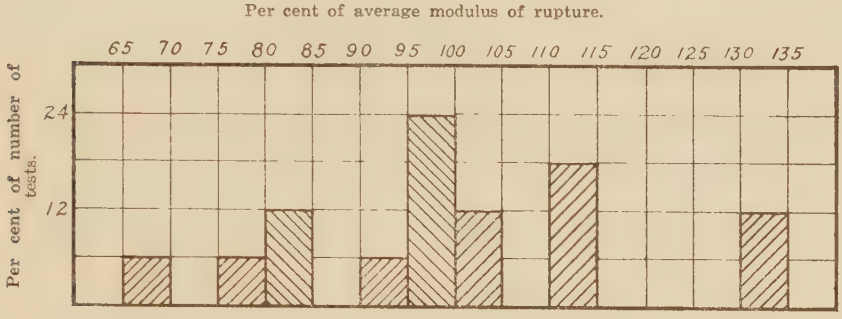

FIG. 11. Variability in modulus of rupture; tangile, structural sizes, 16 tests; average modulus of rupture, 7,640 pounds per square inch.

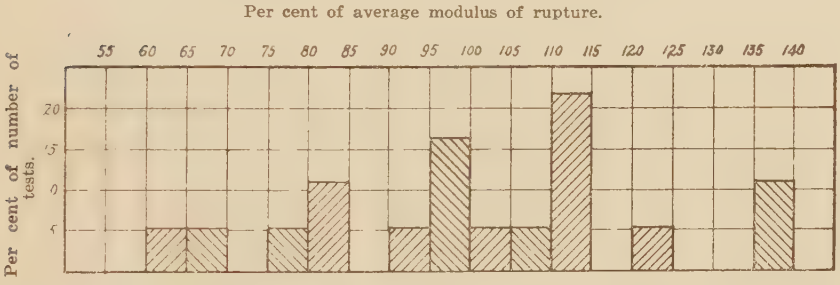
Per cent of average modulus of rupture.
55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140
Per cent of number of tests.
20
15
10
5

FIG. 12. Variability in modulus of rupture; apitong, structural sizes; 18 tests; average modulus of rupture, 6,820 pounds per square inch.

Figs. 11, 12, 13, and 14, inclusive, show how the individual results of the modulus of rupture vary from the average. The cross-hatched areas between the adjacent vertical lines represent graphically the percentage of the total number of tests that fell within the limits indicated on the scale at the bottom, which gives the strength of the pieces in percentages of the average strength. The percentage of the number of pieces is expressed by the figures at the left. For example; by referring to fig. 11, it will be seen that 18 per cent of the tests fell between 110 and

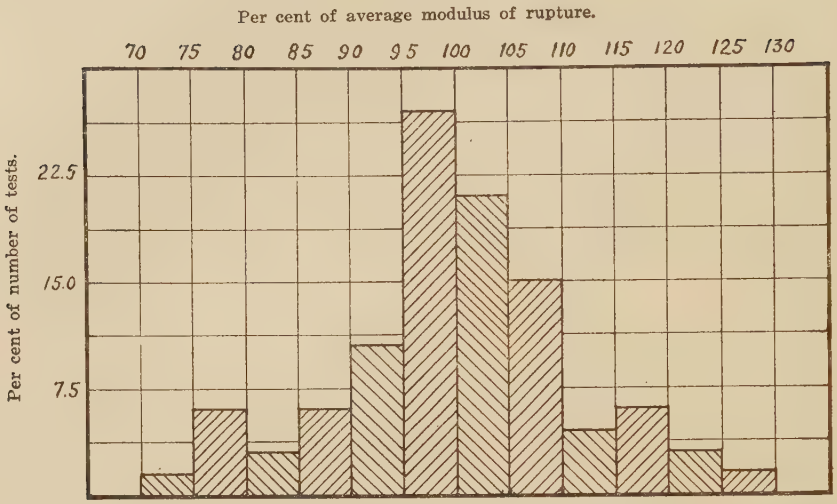

FIG. 13. Variability in modulus of rupture; tangile, small specimens; average modulus of rupture, 1,000 pounds per square inch; 70 tests.

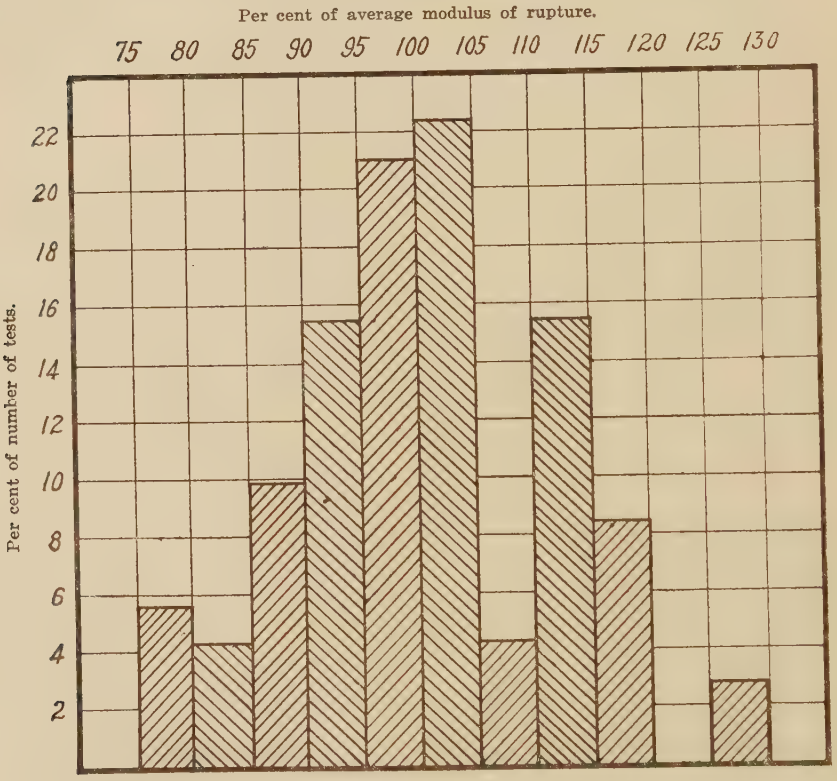

FIG. 14. Variability in modulus of rupture; apitong, small specimens; 78 tests; average modulus of rupture, 10,080 pounds per square inch.

115 per cent of the average; in the case of apitong (fig. 12), 22 per cent of the tests fell between 110 and 115 per cent of the average.

Had the tests been more numerous there would not be gaps between the cross-hatched areas in figs. 11, 12, and 14, and the diagrams would be more symmetrical with respect to the median line or the line showing average modulus of rupture. The diagrams would be very short at the ends and highest at the middle, somewhat like fig. 13. Small specimens are less variable in strength than the structural sizes. The reason for this is that the small specimens are free from defects.

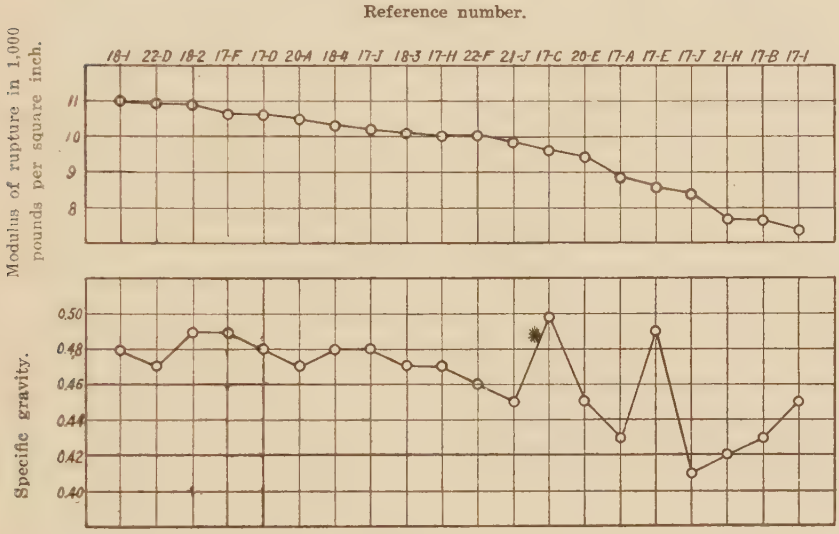

FIG. 15. Tangile No. 2; small specimens.

Figs. 15, 16, and 17 show the relation between dry weight and the modulus of rupture obtained from tests on small clear beams free from defects. Figs. 18 and 19 show the relation between dry weight and modulus of rupture, based on results obtained from tests on large beams. In general it will be observed that the dry weight has a distinct tendency to increase as the modulus of rupture increases. Where a heavy timber of structural size had a low modulus of rupture, it will generally be found, by referring to the tables of results in the appendix, that the timber had serious defects on or near the tension face which in all probability greatly weakened it. The strength of specimens having the same dry weight sometimes varies considerably. This

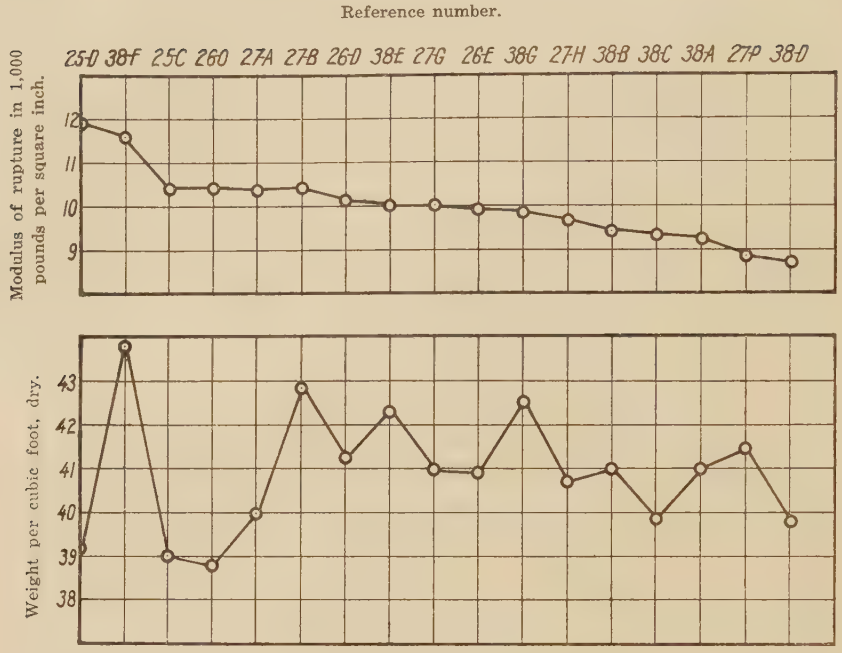

FIG. 16. Apitong No, 4; small specimens.

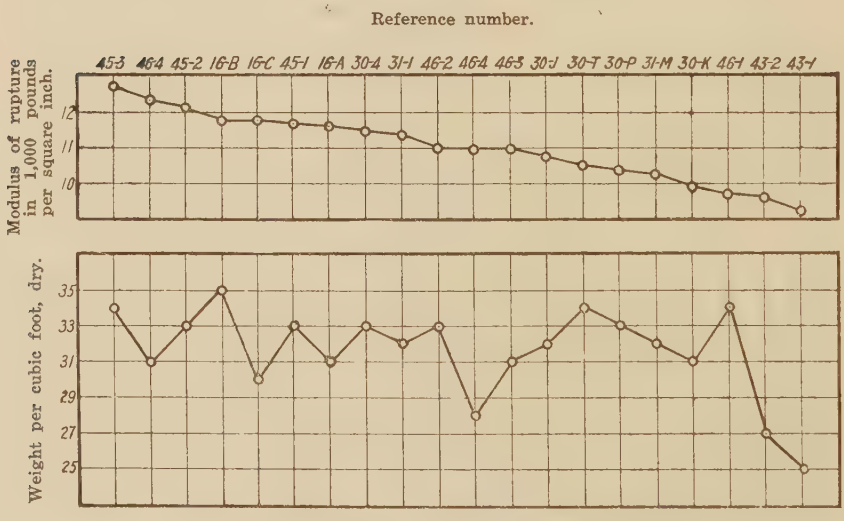

FIG. 17. Tangile No. 1; small specimens.

is due probably to irregularity in grain and to the great difference in moisture of some of the specimens at the time of the tests. Other things being equal, the strength of wood varies directly with its dry weight.

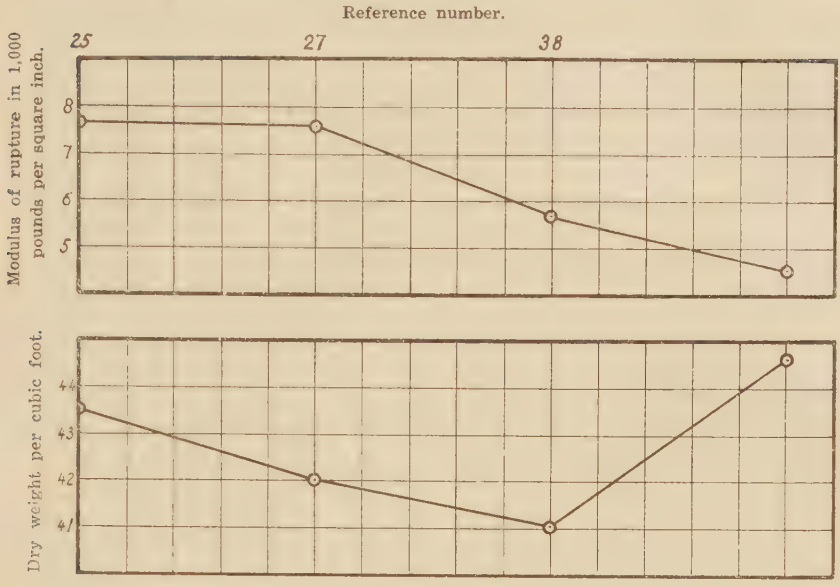

FIG. 18. Apitong No. 4.

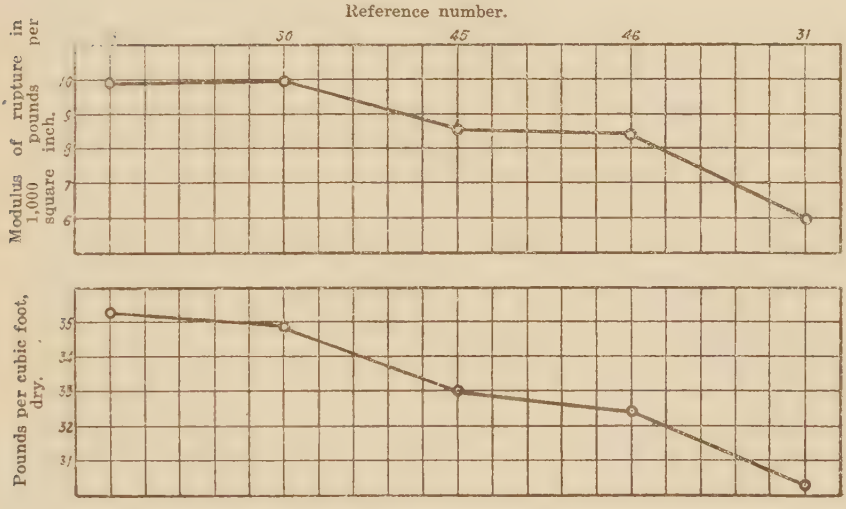

FIG. 19. Tangile No. 1; structural sizes.

The tests undertaken in the Bureau of Science were not sufficiently numerous or typical of the trees growing in different localities to establish very representative data concerning the mechanical properties of each particular species. However, the data presented give a general idea of the mechanical properties of the timbers tested.

STRENGTH AS AFFECTED BY MOISTURE CONTENT

A comparison of the results of tests on air-seasoned material with those on green material shows that, in general, all of the mechanical properties are improved by seasoning.[9] Increase in strength is especially marked on small pieces free from defects. Increase in strength of wood fiber due to drying is, in the case of large timbers, largely offset by a weakening of the timber due to the formation of checks.[10] Hatt [11] says that if the moisture content of a seasoned timber is increased it loses strength rapidly and if thoroughly soaked with water it will become slightly weaker than when green. On this account it is not safe in practice to depend upon an increase in strength of timbers due to seasoning. When, however, large beams are seasoned with ordinary care, it is safe to assume that they will not at any time be weaker than they were when green.

The time factor in timber tests.[12]—Variations in the rate of application of load have a very pronounced effect upon strength and stiffness, as was shown by a specimen under test. If a timber compression block or beam is loaded rapidly, it will appear to have a higher elastic limit and ultimate strength, and will also appear to be stiffer, than when loaded less rapidly. Mills [13] says that this behavior is due to the fact that the deformation lags far behind the load, and if a load is permitted to remain upon a specimen for a perceptible interval of time the deformation increases, the amount of increase becoming greater for heavier loads. Actual failure appears to be consequent upon the attainment of a certain limiting amount of deformation or strain, rather than a limiting load or stress. This condition of affairs makes it necessary to standardize tests by adopting certain speeds of loading for each class of specimens or, rather,

[9] Tests of Structural Timbers, Bull. U. S. Forest Service 108 (1912).

[10] Materials of Engineering Construction, Trans. International Engineering Congress 5 (1915).

[11] Marks, L. S., Mechanical Engineer's Handbook. McGraw Hill Book Co. (1916).

[12] The first mechanical tests of Philippine woods published were made by the Bureau of Forestry of the Philippines. Those tests were made on small specimens only, and the testing machine was operated at the following speeds: For cross-bending, 0.3 inch per minute; for compression along the grain, 0.06 inch per minute. See Bull. Philip. Bur. Forestry 4 (1906).

[13] Mills, A. P., Materials of Construction. New York, John Wiley & Sons Inc. (1915) 647.

so to proportion the speed of the moving head of the testing machine to the dimensions of the specimen that the resultant fiber strain will be a certain specified amount. The usual practice is to adhere to the standards established by the Forest Service for the use of engineers of timber tests. These standards are as follows:[14]

Character of test.	Specimen.	Rate of fiber strain per minute.
		Inches.
Bending tests	Timber of structural size	0.0007
Do	Small test specimen	0.0015
Compression parallel to grain	Timber of structural size	0.0015
Do	Small test specimen	0.0030
Compression perpendicular to grain	Timber of structural size	0.0070
Do	Small test specimen	0.0150
Shearing parallel to grain	do	0.0150

When constant loads, amounting to a large fraction of the ultimate strength of timber, are sustained for very long periods, the deformation may continue to increase until rupture occurs, even though the stress encountered is far below the ultimate strength of the timber as originally determined.

Johnson[15] says that the strength of timber under any kind of permanent load is only about one-half its strength as found by actual, short-time tests.

Factors of safety.—The factors of safety used in the design of timber structures in the United States, as given by different authorities, are as follows: Merriman[16] gives 8 for steady stress, 10 for varying stress, and 15 for shocks; Rankine[17] gives 4 to 5 for dead load and 5 to 10 for live load; the Cambria Steel Co. Handbook gives 10 for tension, 6 for extreme fiber stress in bending, 5 for compression along the grain, and 4 for compression across the grain and for shear; and the (1909) Committee on Wooden Bridges and Trestles of the American Railway Engineering Association used the following factors of

[14] Instructions to Engineers of Timber Tests, Circular (revised) U. S. Forest Service 38 (1909).

[15] Johnson, J. B., Materials of Construction. New York, John Wiley and Son (1912).

[16] Merriman's Mechanics of Materials, 468.

[17] Rankine's Handbook of Civil Engineering.

safety; namely, 5 for extreme fiber stress in bending, 4 for shear along the grain, 3 for compression along the grain, and 2 for compression across the grain. For steady loads these factors become $3\frac{1}{3}$, $2\frac{2}{3}$, 2, and $1\frac{1}{3}$, respectively. The variability of the factors given by different authorities indicates that the factor of safety for timber is largely a matter of guesswork on account of lack of confidence in the reliability of values of strength upon which designing is based. An exhaustive series of tests on the mechanical properties of Philippine timbers will some day give very reliable data upon which to base the design of timber structures. The United States Forest Service [18] seems to have solved this problem for timbers grown in the United States and recommends the following factors of safety: 5 for modulus of rupture, 3 for compression parallel to grain, 1.5 for compression perpendicular to grain, 8 for shearing, and 5 for tension perpendicular to grain.

In applying factors of safety to strength values for timbers it is important to know the moisture of the wood tested, and whether the tests were made only on small, thoroughly seasoned specimens free from defects or on timber of structural sizes. This information is essential, because the results of the tests show that the stresses developed in large timbers were less than the stresses developed in small specimens. The ratio for modulus of rupture varies from 60 to 90 per cent. This difference in values was due to the facts that the small specimens were free from defects and that they contained less moisture.

In conclusion I will say that the character and location of defects in timber have much to do with its strength. Checks in beams weaken their resistance to horizontal shear, especially if the defects are found near the neutral plane. The tests have shown that knots occurring in the central lower part of a beam weaken the timber much more than similar defects found in another part.

APPENDIX

FORMULÆ [19] USED IN COMPUTATIONS

LEGEND

A = Area of cross section, square inches.
B = Area under plate, square inches.
CS = Crushing strength, pounds per square inch.

[18] Bull. U. S. Forest Service 556 (1912).

[19] Instructions to Engineers of Timber Tests, Circular (revised) U. S. Forest Service 38 (1909).

E = Modulus of elasticity, pounds per square inch.
EL = Fiber stress at elastic limit, pounds per square inch.
J = Greatest calculated longitudinal shear, pounds per square inch.
K = 27.7 where weight is in pounds, and 0.061 where weight is in grams.
MR = Modulus of rupture, pounds per square inch.
P = Maximum load, pounds.
P′ = Load at elastic limit, pounds.
S = Dry specific gravity.
W = Weight of specimen, pounds.
△ = Total deflection or compression at elastic limit, inches.
b = Width, inches.
d = Distance between centers of collars, inches.
h = Height, inches.
l = Span, inches (compression, l=length).

BENDING

Load applied at center.	*Uniformly distributed load.*	*Load applied at third points.*
$J=\frac{0.75\times P}{b\times h}$.	$J=\frac{0.75\times P}{b\times h}$.	$J=\frac{b\times h}{0.75\times P}$.
$MR=\frac{1.5\times P\times l}{b\times h^2}$.	$MR=\frac{0.75\times P\times l}{b\times h^2}$.	$MR=\frac{l\times (P+0.75\ W)}{b\times h^2}$.
$EL=\frac{1.5\ P'l}{b\times h^2}$.	$EL=\frac{0.75\times P\times l}{b\times h^2}$.	$EL=\frac{l\times (P'+0.75\ W)}{b\times h^2}$.
$E=\frac{P'\times l^2}{4\times b\times h^3\times \triangle}$.	$E=\frac{P'\times l^3}{6.4\times b\times h^3\times \triangle}$.	$E=\frac{P'\times l^3}{4.7\ b\times h^3\times \triangle}$.

COMPRESSION PARALLEL TO GRAIN

$$CS=\frac{P}{A}. \qquad EL=\frac{P'}{A}. \qquad E=\frac{P'\times d}{A\times \triangle}.$$

COMPRESSION PERPENDICULAR TO GRAIN

$$EL=\frac{P'}{B}.$$

SHEARING PARALLEL TO GRAIN

$$Shear=\frac{P}{A}.$$

SPECIFIC GRAVITY

$$S=\frac{\text{Wet weight}\times K}{(1+\text{per cent}\ \frac{\text{moisture}}{100})\times \text{volume in cubic inches}}.$$

In large beams the weight should be taken into account in calculating the fiber stress. Three-fourths of the weight is added to the load for this reason.

GLOSSARY [20]

Elastic limit.—The elastic limit is that point where the distortion ceases to be in proportion to the load. A timber stressed beyond the elastic limit will not resume its original form immediately upon the removal of the load.

Elasticity.—Elasticity is the property of changing form with the application of force and recovering at once upon release from the force. In any elastic material the amount of compression or deformation is proportional to the force applied.

Fiber stress at elastic limit.—Fiber stress at elastic limit is the stress obtained in a timber by loading it to its elastic limit. It is the greatest stress the timber will take under a given loading and immediately return to its former position.

Mechanical properties.—Mechanical properties are the properties of wood which enable it to resist deformations, loads, shocks, or forces. Thus the ability to resist shearing forces is a mechanical property of timber.

Modulus of elasticity.—Modulus of elasticity is the ratio of stress per unit area to corresponding strain per unit length, the distortion or strain being within the elastic limit. It is the measure of the stiffness or rigidity of a substance.

Modulus of rupture.—Modulus of rupture is the computed fiber stress in the outermost fibers of a beam at the maximum load and is a measure of the ability of a beam to support a slowly applied load for a very short time. The formula by which modulus of rupture is computed is the same as that for fiber stress at elastic limit, the maximum load being substituted for the elastic limit load. It is a definite quantity, and the personal factor does not enter to any great extent into obtaining it. It is consequently not so subject to error as the fiber stress at elastic limit, and for that reason is used more than any other value to represent the strength of wood. Modulus of rupture should always be considered in calculating the strength of beams to be used as stringers, floor joists, etc.

[20] Mechanical Properties of Woods Grown in the United States, Bull. U. S. Dept. Agr. 556 (1917) 20–22.

Shear.—Shear is the name of the stress which tends to keep two adjoining planes or surfaces of a body from sliding, one on the other, under the influence of two equal and parallel forces acting in opposite directions. A force which produces shear in a material is called a shearing force.

Strain.—The deformation or distortion produced by a stress or force is known as strain.

Stress.—Stress is the force or set of forces applied to a body, and which tend to produce a strain. Fiber stress is the distributed force tending to compress, tear apart, or change the relative position of the wood fibers.

TABLE 1.—*Data on individual bending tests of Bataan tangile No. 1.*

[S, horizontal shear failure; C, compression failure; T, tension failure.]

STRUCTURAL SIZES.

Reference No.	Size.	Span.	Moisture.	Weight (green).	Modulus of rupture.	Fiber stress at elastic limit.	Modulus of elasticity.	Greatest calculated longitudinal shear.	Defects.	Manner of failure.	Causes of first failure.
	in.	*in.*	*Per cent.*	*Lbs. per cu. ft.*	*Lbs. per sq. in.*	*Lbs. per sq. in.*	*1,000 lbs. per sq. in.*	*Lbs. per sq. in.*			
31	5.9 by 13.90	132	28.8	39	5,940	4,390	1,921	469	Knots and checks	S	Large checks.
45	4.0 by 7.95	132	24.2	41	8,608	5,200	2,002	390	None	CT	Not apparent.
30	5.0 by 13.85	132	44.4	51	9,928	5,030	2,184	770	Knots and checks	S	Large checks.
16	4.0 by 7.90	120	38.5	47	9,930	5,980	2,030	490	None	CT	Not apparent.
46	4.0 by 8.00	132	23.6	40	8,470	4,120	2,097	385	do	CT	Do.
Average		129	31.9	43	8,575	4,944	2,046	500			

SMALL SPECIMENS.

45-1	2 by 2	28	20.8	40	11,680	5,250	2,010	417	None	T	Not apparent.
46-4	2 by 2	28	20.7	34	10,940	3,660	2,278	391	do	T	Do.
46-3	2 by 2	28	20.0	38	10,920	5,240	1,955	391	do	T	Do.
46-2	2 by 2	28	22.3	41	10,970	6,300	2,612	392	do	T	Do.
46-1	2 by 2	28	20.3	41	9,640	4,200	1,831	345	do	T	Do.
16-A	2 by 2	28	32.6	42	11,536	6,030	1,969	412	do	T	Do.
16-B	2 by 2	28	20.2	43	11,760	6,024	1,874	420	do	T	Do.
16-C	2 by 2	28	38.1	42	11,760	6,037	1,792	420	do	T	Do.
31-C	2 by 2	28	21.4		9,408	5,765	1,751	336	do	T	Do.
30-J	2 by 2	28	32.9	43	10,696	6,291	1,868	382	do	T	Do.
30-K	2 by 2	28	23.0	39	9,856	2,621	1,630	352	do	T	Do.
30-N	2 by 2	28	25.3		10,500	6,287	1,867	375	do	T	Do.
30-P	2 by 2	28	25.3	42	10,304	6,298	1,714	368	do	T	Do.
30-C	2 by 2	28	25.0		10,080	5,775	1,796	360	do	T	Do.
45-3	2 by 2	28	19.2	41	12,780	6,280	1,954	457	do	T	Do.
31-m	2 by 2	28	25.0	40	10,220	4,716	2,124	365	do	T	Do.
31-l	2 by 2	28	24.0	40	11,310	6,299	2,007	404	do	T	Do.
30-t	2 by 2	28	19.6	41	10,444	2,624	1,632	373	do	T	Do.
30-u	2 by 2	28	21.2	40	11,480	5,766	1,883	410	do	T	Do.
43-2	2 by 2	28	20.9	33	9,510	4,185	1,955	341	do	T	Do.
45-4	2 by 2	28	20.0	37	12,380	4,185	1,822	442	do	T	Do.
43-1	2 by 2	28	18.4	30	9,150	4,200	1,711	327	do	T	Do.
45-2	2 by 2	28	20.8	40	12,100	5,250	1,906	429	do	T	Do.
Average		28	23.3	39	10,844	5,186	1,909	387			

TABLE 2.—*Data on individual bending tests of Bataan tangile No. 2.*

[C, compression failure; T, tension failure.]

STRUCTURAL SIZES.

Reference No.	Size.	Span.	Moisture.	Weight (green).	Modulus of rupture.	Fiber stress at elastic limit.	Modulus of elasticity.	Greatest calculated longitudinal shear.	Defects.	Manner of failure.	Causes of first failure.
	in.	*in.*	*Per cent.*	*Lbs. per cu. ft.*	*Lbs. per sq. in.*	*Lbs. per sq. in.*	*1,000 lbs. per sq. in.*	*Lbs. per sq. in.*			
22	4.00 by 7.90	180	25.7	38	7,625	2,880	2,050	251	Checks	C	Checks.
20	4.00 by 8.00	180	30.2	38	7,410	3,933	1,779	247	None	C	Not apparent.
21	3.95 by 7.95	180	27.8	37	7,325	4,484	1,750	234	Checks and knots	C	Checks and knots.
18	7.95 by 11.85	168	39.5	40	8,694	4,830	2,006	460	do	CT	Not apparent.
17	6.02 by 11.97	168	43.9	54	7,880	4,380	1,823	421	do	CT	Do.
Average		175	33.4	41	7,786	4,057	1,861	322			

SMALL SPECIMENS.

18-1	2 by 2	28	18.7	36	11,000	3,142	1,465	393	None	T	Not apparent.
18-2	2 by 2	28	21.3	37	10,900	3,140	1,464	390	do	T	Do.
18-3	2 by 2	28	21.3	36	10,100	2,092	1,710	361	do	T	Do.
18-4	2 by 2	28	19.0	36	10,320	2,100	1,830	369	do	T	Do.
17-J	2 by 2	28	30.4	39	10,248	5,737	1,874	366	do	T	Do.
17-H	2 by 2	28	35.1	40	10,080	5,236	1,809	360	do	T	Do.
17-I	2 by 2	28	41.7	40	7,364	4,208	1,617	263	do	T	Do.
17-F	2 by 2	28	21.0	37	10,660	5,503	1,843	345	do	T	Do.
17-G	2 by 2	28	35.9	35	8,400	4,462	1,500	300	do	T	Do.
17 C	2 by 2	28	18.5	37	9,660	4,450	1,615	345	do	T	Do.
17-D	2 by 2	28	19.4	36	10,640	4,360	1,460	380	do	T	Do.
17-E	2 by 2	28	19.9	36	8,540	4,467	1,762	305	do	T	Do.
17-A	2 by 2	28	18.0	32	8,876	4,202	1,715	317	do	T	Do.
17-B	2 by 2	28	17.3	32	7,640	4,088	1,483	280	do	T	Do.
20-A	2 by 2	28	18.7	35	10,500	5,250	1,182	375	do	T	Do.
20-C	2 by 2	28			9,884	5,243	1,712	353	do	T	Do.
20-E	2 by 2	28	20.8	34	9,436	6,290	1,580	337	do	T	Do.
22-D	2 by 2	28	19.1	35	10,948	6,285	2,003	391	do	T	Do.
21-J	2 by 2	28	20.9	34	9,828	5,759	1,881	351	do	T	Do.
22-F	2 by 2	28	18.5	34	10,052	5,238	1,901	359	do	T	Do.
21-S	2 by 2	28			10,752	5,244	1,903	384	do	T	Do.
21-H	2 by 2	28	18.7	31	7,680	5,250	1,632	274	do	T	Do.
Average		28	22.7	36	9,704	4,624	1,683	345			

TABLE 3.—*Data on individual bending tests of Bataan tangile No. 3.*

[S, horizontal shear failure; T, tension failure.]

COMMERCIAL SIZES.

Reference No.	Size.	Span.	Moisture.	Weight (green).	Modulus of rupture.	Fiber stress at elastic limit.	Modulus of elasticity.	Greatest calculated longitudinal shear.	Defects.	Manner of failure.	Causes of first failure.
	in.	*in.*	*Per cent.*	*Lbs. per cu. ft.*	*Lbs. per sq. in.*	*Lbs. per sq. in.*	*1,000 lbs. per sq. in.*	*Lbs. per sq. in.*			
50	7.95 by 15.95	180	25.9	38	7,177	4,086	1,535	477	Checks and knots	TS	Checks.
32	5.90 by 11.90	180	33.8	40	6,453	4,082	1,525	320	do	T	Large knot, 12 inches from center of lower face.
Average		180	29.8	39	6,815	4,084	1,530	398			
SMALL SPECIMENS.											
32-Q	2 by 2	28	24.2	37	9,296	6,284	1,466	332	None	T	Not apparent.
32-M	2 by 2	28	31.7	38	7,812	5,242	1,317	279	do	T	Do.
32-L	2 by 2	28	23.4	36	8,708	5,770	1,507	311	do	T	Do.
32-K	2 by 2	28	18.6		8,204	4,717	1,467	293	do	T	Do.
32-N	2 by 2	28	23.3	38	7,980	4,970	1,443	285	do	T	Do.
32-O	2 by 2	28	27.6	34	8,820	4,710	1,538	315	do	T	Do.
50-3	2 by 2	28	21.6	37	9,750	4,190	1,710	349	do	T	Do.
50-4	2 by 2	28	22.0	33	9,660	3,150	1,955	346	do	T	Do.
50-1	2 by 2	28	23.4	35	9,200	4,192	1,520	329	do	T	Do.
50-2	2 by 2	28	21.5	34	9,950	4,900	1,764	356	do	T	Do.
Average		28	23.7	35	8,938	4,812	1,568	319			

TABLE 4.—*Data on individual bending tests of Bataan tangile No. 4.*

[C, compression failure; T, tension failure.]

COMMERCIAL SIZES.

Reference No.	Size.	Span.	Moisture.	Weight (green).	Modulus of rupture.	Fiber stress at elastic limit.	Modulus of elasticity.	Greatest calculated longitudinal shear.	Defects.	Manner of failure.	Causes of first failure.
	in.	*in.*	*Per cent.*	*Lbs. per cu. ft.*	*Lbs. per sq. in.*	*Lbs. per sq. in.*	*1,000 lbs. per sq. in.*	*Lbs. per sq. in.*			
19	4.30 by 7.84	180	27.1	35	7,850	2,770	1,770	216	Knots and checks	C	Not apparent.
23	4.00 by 8.00	180	27.6	33	5,220	2,107	1,464	174	do	CT	Knot at the center of upper face.
24	3.96 by 7.95	180	24.0	38	7,516	3,308	1,794	249	None	CT	Not apparent.
29	3.95 by 11.90	180	20.9	38	6,272	2,573	1,733	311	Checks and knots	TC	Irregular grain caused by knot.
Average		180	24.9	36	6,714	2,689	1,690	237			

177655—3

TABLE 4.—*Data on individual bending tests of Bataan tangile No. 4*—Continued.

SMALL SPECIMENS.

Reference No.	Size.	Span.	Moisture.	Weight (green).	Modulus of rupture.	Fiber stress at elastic limit.	Modulus of elasticity.	Greatest calculated longitudinal shear.	Defects.	Manner of failure.	Causes of first failure.
	in.	*in.*	*Per cent.*	*Lbs. per cu. ft.*	*Lbs. per sq. in.*	*Lbs. per sq. in.*	*1,000 lbs. per sq. in.*	*Lbs. per sq. in.*			
19-1	2 by 2	28	18.15	34	10,190	2,100	1,960	363	None	T	Not apparent.
19-2	2 by 2	28	18.40	34	9,440	5,240	1,430	337	do	T	Do.
19-3	2 by 2	28	16.20	34	9,430	4,190	1,830	337	do	T	Do.
19-4	2 by 2	28	18.15	34	9,680	4,200	1,615	346	do	T	Do.
23-9	2 by 2	28	18.7	36	10,556	6,286	1,642	377	do	T	Do.
23-h	2 by 2	28	18.7	34	10,276	6,284	1,579	367	do	T	Do.
-N	2 by 2	28	19.1	35	9,632	6,298	1,714	344	do	T	Do.
24-G	2 by 2	28	19.9		9,548	3,147	1,370	341	do	T	Do.
24-a	2 by 2	28	18.3	33	9,688	5,760	1,539	346	do	T	Do.
29-A	2 by 2	28	20.6	35	9,828	4,193	1,826	351	do	T	Do.
29-B	2 by 2	28	20.4	35	9,968	5,246	1,370	356	do	T	Do.
29-b	2 by 2	28	2.05	35	9,968	5,770	1,449	356	do	T	Do.
29-c	2 by 2	28	18.1	35	10,472	5,249	1,714	374	do	T	Do.
29-f	2 by 2	28	19.0	38	9,296	5,760	1,254	332	do	T	Do.
I	2 by 2	28	19.0	35	9,744	5,768	1,712	348	do	T	Do.
Average		28	18.8	35	9,847	5,032	1,600	351			

TABLE 5.—*Data on individual bending tests of Bataan apitong No. 1.*

[S, horizontal shear failure; T, tension failure.]

COMMERCIAL SIZES.

Reference No.	Size.	Span.	Moisture.	Weight (green).	Modulus of rupture.	Fiber stress at elastic limit.	Modulus of elasticity.	Greatest calculated longitudinal shear.	Defects.	Manner of failure.	Causes of first failure.
	in.	*in.*	*Per cent.*	*Lbs. per cu. ft.*	*Lbs. per sq. in.*	*Lbs. per sq. in.*	*1,000 lbs. per sq. in.*	*Lbs. per sq. in.*			
48	5.90 by 14.05	132	42.8	57	6,989	4,075	3,162	558	Checks	S	Large checks 2 inches above neutral plane.
52	7.88 by 14.0	132	48.1	59	6,285	4,099	1,669	500	Checks and knots	S	Large checks at neutral plane.
Average		132	45.4	58	6,637	4,087	2,415	529			
SMALL SPECIMENS.											
48-1	2 by 2	28	23.8	52	9,160	3,370	2,200	328	None	T	Not apparent.
48-2	2 by 2	28	31.7	56	10,500	4,190	2,620	378	do	T	Do.
48-3	2 by 2	28	27.0	53	11,280	5,240	2,282	402	do	T	Do.
48-3	2 by 2	28	24.8	52	11,220	3,670	2,668	400	do	T	Do.
48-4	2 by 2	28	24.7	54	11,400	4,190	2,281	407	do	T	Do.
52-5	2 by 2	28	27.8	51	12,840	4,660	2,540	458	do	T	Do.
52-6	2 by 2	28	28.10	55	11.180	2,120	2,286	400	do	T	Do.
52-7	2 by 2	28	26.4	52	11,820	4,200	2,040	420	do	T	Do.
52-8	2 by 2	28	25.9	52	11,660	5,250	2,145	416	do	T	Do.
Average		28	26.6	53	11,228	4,098	2,339	401			

TABLE 6.—*Data on individual bending tests of Bataan apitong No. 2.*

[S, horizontal shear failure; C, compression failure; T, tension failure.]

COMMERCIAL SIZES.

Reference No.	Size.	Span.	Moisture.	Weight (green).	Modulus of rupture.	Fiber stress at elastic limit.	Modulus of elasticity.	Greatest calculated longitudinal shear.	Defects.	Manner of failure.	Causes of first failure.
	in.	*in.*	*Per cent.*	*Lbs. per cu. ft.*	*Lbs. per sq. in.*	*Lbs. per sq. in.*	*1,000 lbs. per sq. in.*	*Lbs. per sq. in.*			
28	3.92 by 9.95	156	75.3	51	9,323	4,820	2,188	446	Checks	CT	Not apparent.
39	4.04 by 11.92	156	39.2	55	6,543	3,257	2,210	375	do	TS	Checks.
47	5.95 by 14.06	156	43.1	58	6,804	2,413	1,778	458	do	CS	Do.
49	5.30 by 14.05	156	55.8	59	4,115	2,678	1,974	278	Knots and checks	S	Do.
Average		156	53.3	55	6,696	3,292	2,037	389			

SMALL SPECIMENS.

28-M	2 by 2	28	25.6	50	9,632	5,249	1,758	344	None	T	Not apparent.
28-K	2 by 2	28	27.1	49	10,668	5,760	1,792	381	do	T	Do.
28-c	2 by 2	28	21.6	48	11,340	5,761	2,214	405	do	T	Do.
28-J	2 by 2	28	19.5	51	11,220	7,232	1,817	451	do	T	Do.
28-F	2 by 2	28	28.9	52	9,576	6,296	1,713	342	do	T	Do.
28-L	2 by 2	28	22.6	48	10,416	6,290	1,712	372	do	T	Do.
39-1	2 by 2	28	19.62	52	11,800	4,200	2,285	420	do	T	Do.
39-2	2 by 2	28	22.3	50	11,450	4,720	2,130	408	do	T	Do.
39-3	2 by 2	28	17.30	50	12,850	4,200	2,390	460	do	T	Do.
39-4	2 by 2	28	19.4	49	11,150	5,240	2,142	398	do	T	Do.
39-5	2 by 2	28	22.0	50	9,820	2,100	2,492	350	do	T	Do.
Average		28	22.3	49	10,910	5,186	2,040	393			

TABLE 7.—*Data on individual bending tests of Bataan apitong No. 3.*

[C, compression failure; T, tension failure.]

COMMERCIAL SIZES.

Reference No.	Size.	Span.	Moisture.	Weight (green).	Modulus of rupture.	Fiber stress at elastic limit.	Modulus of elasticity.	Greatest calculated longitudinal shear.	Defects.	Manner of failure.	Causes of first failure.
	in.	*in.*	*Per cent.*	*Lbs. per cu. ft.*	*Lbs. per sq. in.*	*Lbs. per sq. in.*	*1,000 lbs. per sq. in.*	*Lbs. per sq. in.*			
33	4.00 by 11.95	132	43.0	60	7,850	4,155	1,953	533	Knot and checks	C	Knot.
41	3.90 by 7.80	132	25.9	58	8,596	5,826	2,251	381	Checks	C	Not apparent.
42	5.92 by 7.78	132	45.6	59	7,424	3,488	1,952	337	Checks and knots	C	Checks.
44	8.00 by 8.02	132	40.5	58	7,549	3,586	2,022	344	do	T C	Knots.
Average		132	38.7	59	7,854	4,263	2,044	398			
SMALL SPECIMENS.											
33-h	2 by 2	28	33.7	57	9,884	5,243	1,903	353	None	T	Not apparent.
33-m	2 by 2	28	25.4	57	11,284	4,719	2,055	403	do	T	Do.
33-e	2 by 2	28	35.6	57	9,660	4,188	1,710	345	do	T	Do.
33-f	2 by 2	28	26.5	56	10,948	7,344	1,999	391	do	T	Do.
33-g	2 by 2	28	39.4	59	8,484	5,760	1,792	303	do	T	Do.
33-l	2 by 2	28	31.8	57	10,248	5,244	2,284	366	do	T	Do.
33-j	2 by 2	28	34.5	56	9,296	5,243	2,014	332	do	T	Do.
41-1	2 by 2	28	30.2	55	10,500	4,180	2,180	375	do	T	Do.
41-2	2 by 2	28	19.8	50	12,080	5,250	2,452	430	do	T	Do.
44-3	2 by 2	28	26.6	52	10,640	5,230	1,952	381	do	T	Do.
41-3	2 by 2	28	28.1	55	11,490	5,250	2,452	410	do	T	Do.
41-4	2 by 2	28	29.4	58	10,500	4,200	1,960	375	do	T	Do.
42-1	2 by 2	28	22.1	52	10,220	3,148	2,170	365	do	T	Do.
42-2	2 by 2	28	22.2	56	10,100	4,190	1,955	360	do	T	Do.
42-3	2 by 2	28	24.2	53	10,140	3,150	2,055	362	do	T	Do.
44-2	2 by 2	28	29.0	54	10,440	2,100	2,490	373	do	T	Do.
44-4	2 by 2	28	35.0	54	9,350	4,190	2,110	334	do	T	Do.
Average		28	29.0	55	10,327	4,514	2,090	368			

TABLE 8.—*Data on individual bending tests of Bataan apitong No. 4.*

[C, compression failure; T, tension failure.]

COMMERCIAL SIZES.

Reference No.	Size.	Span.	Moisture.	Weight (green).	Modulus of rupture.	Fiber stress at elastic limit.	Modulus of elasticity.	Greatest calculated longitudinal shear.	Defects.	Manner of failure.	Causes of first failure.
	in.	*in.*	*Per cent.*	*Lbs. per cu. ft.*	*Lbs. per sq. in.*	*Lbs per sq. in.*	*1,000 lbs. per sq. in.*	*Lbs. per sq. in.*			
25	3.90 by 7.72	180	31.3	57	7,659	4,460	1,900	245	Checks	T	Checks.
26	3.91 by 7.92	180	34.7	60	4,515	2,927	1,757	149	Knots and checks	T	Knots and checks.
27	7.88 by 11.85	180	46.5	62	7,594	3,902	2,027	375	Checks	C	Not apparent.
38	4.00 by 7.92	180	36.4	56	5,696	2,858	2,163	188	Checks and knots	T	Checks.
Average		180	36.9	58	6,116	3,536	1,961	239			

SMALL SPECIMENS.

25-d	2 by 2	28	18.5		10,500	6,825	1,938	375	None	T	Not apparent.
25-D	2 by 2	28	19.9	47	11,956	5,243	1,903	427	do	T	Do.
25-C	2 by 2	28	20.60	47	10,472	7,348	1,714	374	do	T	Do.
26-o	2 by 2	28	25.9	49	10,472	5,249	1,905	374	do	T	Do.
26-E	2 by 2	28	22.3	50	9,968	6,820	1,856	356	do	T	Do.
26-D	2 by 2	28	26.0	52	10,108	6,284	1,785	361	do	T	Do.
26-	2 by 2	28	22.0		8,400	5,250	1,559	300	do	T	Do.
27-a	2 by 2	28	22.1	49	10,444	6,297	2,006	373	do	T	Do.
27-b	2 by 2	28	18.9	51	10,416	7,346	1,845	372	do	T	Do.
27-p	2 by 2	28	25.2	52	8,820	6,281	1,709	315	do	T	Do.
27-H	2 by 2	28	25.4	51	9,688	5,772	1,933	346	do	T	Do.
27-G	2 by 2	28	22.0	50	10,052	5,249	2,017	359	do	T	Do.
38-A	2 by 2	28	31.7	54	9,296	3,666	1,842	332	do	T	Do.
38-B	2 by 2	28	24.9	51	9,408	5,765	1,024	336	do	T	Do.
38-C	2 by 2	28	23.0	49	9,380	6,288	2,003	335	do	T	Do.
38-D	2 by 2	28	38.3	55	9,708	4,721	1,542	311	do	T	Do.
38-E	2 by 2	28	32.4	56	10,080	3,665	1,995	360	do	T	Do.
38-F	2 by 2	28	25.8	55	11,648	7,345	1,999	416	do	T	Do.
38-G	2 by 2	28	29.6	55	8,856	5,772	1,795	352	do	T	Do.
Average		28	24.9	51	9,982	5,851	1,803	356			

TABLE 9.—*Data on individual bending tests of Bataan apitong No. 5.*

[T, tension failure.]

COMMERCIAL SIZES.

Reference No.	Size.	Span.	Moisture.	Weight (green).	Modulus of rupture.	Fiber stress at elastic limit.	Modulus of elasticity.	Greatest calculated longitudinal shear.	Defects.	Manner of failure.	Causes of first failure.
	in.	*in.*	*Per cent.*	*Lbs. per cu. ft.*	*Lbs. per sq. in.*	*Lbs. per sq. in.*	*1,000 lbs. per sq. in.*	*Lbs. per sq. in.*			
35	4.00 by 11.90	132	53.7	62	5,546	3,259	1,410	375	Checks and knots.	T	Checks and knots.
36	4.00 by 11.98	156	48.2	60	9,539	4,480	2,151	366	do	T	Do.
37	3.96 by 7.80	132	28.8	58	6,543	2,725	1,625	290	do	T	Do.
Average		132	43.5	60	7,209	3,488	1,728	343			

SMALL SPECIMENS.

34-o	2 by 2	28	31.1	53	8,708	5,245	1,713	311	None	T	Not apparent.
34-i	2 by 2	28	23.6	53	9,660	5,759	1,791	345	do	T	Do.
34-b	2 by 2	28	38.9	58	8,848	5,235	1,628	316	do	T	Do.
34-c	2 by 2	28	18.7	56	8,652	3,146	1,712	309	do	T	Do.
34-h	2 by 2	28	27.6	54	7,812	4,188	1,351	279	do	T	Do.
35-a	2 by 2	28	25.3	53	10,388	4,197	1,713	371	do	T	Do.
35-A	2 by 2	28	26.6	55	9,520	5,769	1,507	340	do	T	Do.
35-I	2 by 2	28	27.5	54	8,092	3,666	1,596	289	do	T	Do.
35-H	2 by 2	28	34.2	54	9,324	4,200	1,751	333	do	T	Do.
35-G	2 by 2	28	35.1	59	9,100	3,669	1,598	325	do	T	Do.
36-B	2 by 2	28	28.8	53	9,604	5,248	1,672	343	do	T	Do.
36-C	2 by 2	28	26.9	54	7,952	3,666	1,496	284	do	T	Do.
36-D	2 by 2	28	37.3	57	8,736	3,668	1,452	312	do	T	Do.
36-F	2 by 2	28	31.8	58	9,828	4,188	1,710	351	do	T	Do.
36-E	2 by 2	28	25.8	53	8,512	4,723	2,257	304	do	T	Do.
37-C	2 by 2	28	30.4	56	9,100	4,712	1,539	325	do	T	Do.
37-e	2 by 2	28	39.9	57	7,980	2,093	1,367	285	do	T	Do.
37-d	2 by 2	28	26.3	56	8,988	4,713	1,502	321	do	T	Do.
37-f	2 by 2	28	28.2	55	9,322	2,094	2,280	334	do	T	Do.
Average		28	29.9	55	8,945	4,146	1,659	319			

TABLE 10.—*Data on individual bending tests of Bataan apitong No. 6.*

[T, tension failure.]

COMMERCIAL SIZES.

Reference No.	Size.	Span.	Moisture.	Weight (green).	Modulus of rupture.	Fiber stress at elastic limit.	Modulus of elasticity.	Calculated longitudinal shear.	Defects.	Manner of failure.	Causes of first failure.
	in.	*in.*	*Per cent.*	*Lbs. per cu. ft.*	*Lbs. per sq. in.*	*Lbs. per sq. in.*	*1,000 lbs. per sq. in.*	*Lbs. per sq. in.*			
40	5.20 by 11.59	156	40.6	60	5,222	3,122	1,291	291	Knots and checks.	T	Knots and checks.
SMALL SPECIMENS.											
40–a	2 by 2	28	22.4	49	9,160	4,200	1,712	328	None	T	Not apparent.
40–1	2 by 2	28	21.3	54	9,950	3,150	1,960	356	do	T	Do.
40–2	2 by 2	28	20.1	54	11,480	3,150	1,955	410	do	T	Do.
Average		28	21.2	52	10,196	3,500	1,875	364			

TABLE 11.—*Data on individual bending tests of apitong (from market).*

[S, horizontal shear failure; C, compression failure; T, tension failure.]

COMMERCIAL SIZES.

Reference No.	Size.	Span.	Moisture.	Weight (green).	Modulus of rupture.	Fiber stress at elastic limit.	Modulus of elasticity.	Calculated longitudinal shear.	Defects.	Manner of failure.	Causes of first failure.
	in.	*in.*	*Per cent.*	*Lbs. per cu. ft.*	*Lbs. per sq. in.*	*Lbs. per sq. in.*	*1,000 lbs. per sq. in.*	*Lbs. per sq. in.*			
7	4.00 by 11.75	144	19.0	43	9,600	4,680	2,200	587	None	CT	Not apparent
8	3.80 by 12.55	144	46.9	50	9,300	4,330	1,959	608	Knots and checks	CT	Checks
9	3.72 by 11.70	144	76.6	55	6,070	3,390	1,710	370	do	C	Do.
15	4.00 by 14.00	120	52.3	62	6,500	5,200	1,690	560	Checks	S	Do.
Average		138	48.7	52	7,867	4,400	1,889	531			
SMALL SPECIMENS.											
7-a	2 by 2	28	18.2	39	11,116	7,340	1,957	397	None	T	Not apparent.
7-b	2 by 2	28	17.9	40	11,928	6,816	2,071	426	do	T	Do.
7-c	2 by 2	28	17.5	42	11,900	6,814	2,023	425	do	T	Do.
7-e	2 by 2	28	17.5	42	11,340	8,380	1,824	405	do	T	Do.
7-f	2 by 2	28	17.4	41	10,610	6,297	1,714	379	do	T	Do.
8-D	2 by 2	28	23.5	42	11,340	5,700	1,714	405	do	T	Do.
8-E	2 by 2	28	31.1	46	11,172	6,288	1,711	399	do	T	Do.
8-F	2 by 2	28	27.4	45	12,544	4,198	2,109	448	do	T	Do.
9-a	2 by 2	28	24.7	35	8,372	3,149	1,714	299	do	T	Do.
9-c	2 by 2	28	30.0	35	7,952	5,238	1,368	284	do	T	Do.
9-d	2 by 2	28	18.1	32	8,568	4,725	1,470	306	do	T	Do.
15-1	2 by 2	28	16.82	54	10,620	5,240	2,282	380	do	T	Do.
15-2	2 by 2	28	15.4	53	9,900	5,250	1,960	354	do	T	Do.
Average		28	21.1	42	9,789	5,802	1,839	377			

TABLE 12.—*Data on individual bending tests of guijo (from market).*

[C, compression failure; T, tension failure.]

COMMERCIAL SIZES.

Reference No.	Size.	Span.	Moisture.	Weight (green).	Modulus of rupture.	Fiber stress at elastic limit.	Modulus of elasticity.	Calculated longitudinal shear.	Defects.	Manner of failure.	Causes of first failure.
	in.	*in.*	*Per cent.*	*Lbs. per cu. ft.*	*Lbs. per sq. in.*	*Lbs. per sq. in.*	*1,000 lbs. per sq. in.*	*Lbs. per sq. in.*			
2	4.00 by 12.00	144	60.7	64	11,540	7,400	1,820	720	Knots	CT	Not apparent.
3	4.00 by 12.00	144	72.6	71	11,850	8,700	2,440	739	do	CT	Do.
5	4.00 by 12.06	144	63.4	69	11,850	7,990	2,870	740	do	CT	Do.
6	3.75 by 12.00	144	56.6	64	11,400	8,000	2,300	710	Knots and checks	CT	Do.
Average		144	63.3	67	11,660	8,022	2,357	727			

SMALL SPECIMENS.

2-A	2 by 2	28	42.2	55	13,636	8,391	2,192	487	None	T	Not apparent.
2-B	2 by 2	28	48.8	57	13,328	8,395	2,285	476	do	T	Do.
2-C	2 by 2	28	45.8	56	13,440	8,400	2,286	480	do	T	Do.
2-D	2 by 2	28	45.2	54	13,748	6,296	2,285	491	do	T	Do.
2-E	2 by 2	28	46.7	55	13,244	6,294	2,284	473	do	T	Do.
3-A	2 by 2	28	46.6	57	11,228	8,394	1,828	401	do	T	Do.
3-B	2 by 2	28	35.5	63	11,116	7,340	1,844	397	do	T	Do.
3-C	2 by 2	28	51.7	59	12,180	7,350	1,778	435	do	T	Do.
3-D	2 by 2	28	53.9	60	11,284	6,298	1,870	403	do	T	Do.
3-E	2 by 2	28	54.5	61	11,928	7,340	1,998	426	do	T	Do.
5-A	2 by 2	28	27.3	53	13,216	7,870	2,056	472	do	T	Do.
5-B	2 by 2	28	26.6	52	13,496	7,861	2,445	482	do	T	Do.
5-C	2 by 2	28	30.5	53	12,880	7,345	2,340	460	do	T	Do.
5-f	2 by 2	28	30.5	56	13,076	8,920	2,285	467	do	T	Do.
5	2 by 2	28	17.8		14,280	9,450	2,374	510	do	T	Do.
6-a	2 by 2	28	25.0	49	13,104	7,338	2,179	468	do	T	Do.
6-b	2 by 2	28	22.8	49	12,292	8,386	2,191	439	do	T	Do.
6-c	2 by 2	28	27.4	49	13,020	5,763	2,091	465	do	T	Do.
6-A	2 by 2	28	21.7	42	12,908	8,395	2,102	461	do	T	Do.
Average		28	36.8	54	12,810	7,675	2,142	457			

TABLE 13.—*Data on individual bending tests of lumbayan (from market).*

[C, compression failure; T, tension failure.]

COMMERCIAL SIZES.

Reference No.	Size.	Span.	Moisture.	Weight (green).	Modulus of rupture.	Fiber stress at elastic limit.	Modulus of elasticity.	Calculated longitudinal shear.	Defects.	Manner of failure.	Causes of first failure.
	in.	*in.*	*Per cent.*	*Lbs. per cu. ft.*	*Lbs. per sq. in.*	*Lbs. per sq. in.*	*1,000 lbs. per sq. in.*	*Lbs. per sq. in.*			
1	3.98 by 11.76	144	18.0	30	8,463	5,232	1,753	518	Checks	CT	Not apparent.
10	3.95 by 11.75	144	16.9	38	5,050	3,960	1,270	350	Knots and checks	T	Knots and checks.
51	4.45 by 12.15	144	46.9	48	4,682	2,547	1,746	254	Checks	T	Not apparent.
Average		144	27.2	39	6,065	3,913	1,589	374			
SMALL SPECIMENS.											
1-A	2 by 2	28	17.3	29	9,660	4,200	1,614	345	None	T	Not apparent.
1-B	2 by 2	28	17.7	31	9,436	4,193	1,521	337	do	T	Do.
1-C	2 by 2	28	14.4	32	10,080	4,200	1,614	360	do	T	Do.
1-D	2 by 2	28	17.4	31	10,080	6,283	1,520	360	do	T	Do.
10-a	2 by 2	28	19.5	43	10,696	5,767	1,569	382	do	T	Do.
10-b	2 by 2	28	17.2	37	9,436	5,766	1,395	337	do	T	Do.
10-c	2 by 2	28	18.8	36	8,680	5,769	1,395	310	do	T	Do.
10-d	2 by 2	28	18.0	37	9,464	3,670	1,712	338	do	T	Do.
10-e	2 by 2	28	17.6	37	9,072	4,719	1,503	324	do	T	Do.
51-7	2 by 2	28	32.8	45	8,920	5,260	1,494	318	do	T	Do.
51-8	2 by 2	28	37.70	47	7,500	2,095	1,440	268	do	T	Do.
51-9	2 by 2	28	22.6	45	8,400	5,250	1,374	300	do	T	Do.
51-10	2 by 2	28	23.3	42	9,020	4,190	1,610	322	do	T	Do.
51-11	2 by 2	28	21.4	39	8,400	3,150	1,585	300	do	T	Do.
Average		28	21.2	38	9,202	3,623	1,524	328			

TABLE 14.—*Data on individual bending tests of gisok (from market).*

[C, compression failure; T, tension failure.]

COMMERCIAL SIZES.

Reference No.	Size.	Span.	Moisture.	Weight (green).	Modulus of rupture.	Fiber stress at elastic limit.	Modulus of elasticity.	Calculated longitudinal shear.	Defects.	Manner of failure.	Causes of first failure.
	in.	*in.*	*Per cent.*	*Lbs. per cu. ft.*	*Lbs. per sq. in.*	*Lbs. per sq. in.*	*1,000 lbs. per sq. in.*	*Lbs. per sq. in.*			
11	3.73 by 10.45	144	17.3	63	9,400	7,420	2,620	510	Knots and checks	T	Not apparent
12	3.75 by 11.55	144	16.8	60	15,370	9,480	2,702	925	do	T	Do.
13	3.72 by 10.55	144	18.9	62	17,500	11,150	3,420	960	do	CT	Do.
14	3.75 by 10.54	144	16.8	57	14,300	9,310	3,120	785	Checks	CT	Do.
Average		144	17.4	60	14,142	9,340	2,965	795			
SMALL SPECIMENS.											
11-e	2 by 2	28	17.9	61	18,480	11,550	2,434	660	None	T	Not apparent.
11-E	2 by 2	28	15.3	64	17,080	10,488	2,740	610	do	T	Do.
11-D	2 by 2	28	14.6	63	17,296	11,548	2,694	617	do	T	Do.
11-d	2 by 2	28	15.3	66	19,152	10,485	2,978	684	do	T	Do.
12-1	2 by 2	28	17.0	59	17,460	11,550	2,741	623	do	T	Do.
12-2	2 by 2	28	13.25	59	18,100	11,520	3,008	646	do	T	Do.
12-3	2 by 2	28	14.4	61	16,710	11,540	2,292	597	do	T	Do.
13-1	2 by 2	28	18.0	61	20,300	13,620	3,420	725	do	T	Do.
13-2	2 by 2	28	17.6	62	19,350	9,420	3,510	692	do	T	Do.
13-3	2 by 2	28	18.5	61	18,420	10,500	3,422	658	do	T	Do.
14-1	2 by 2	28	18.11	59	18,740	13,150	2,740	695	do	T	Do.
14-2	2 by 2	28	17.3	59	19,050	11,540	3,010	680	do	T	Do.
14-3	2 by 2	28	20.6	61	17,190	10,490	2,979	615	do	T	Do.
Average		28	16.7	61	18,256	11,238	2,920	653			

TABLE 15.—*Average results of bending tests of timber of structural sizes and small specimens.*

Species.	Tests.	Moisture.	Specific gravity oven dry, based on volume when green.	Modulus of elastic resilience.	Modulus of rupture.	Fiber stress at elastic limit.	Modulus of elasticity.	Greatest calculated longitudinal shear.	Ratio of the modulus of rupture of structural sizes and small specimens.
		Per cent.		*Lbs. per cu. in.*	*Lbs. per sq. in.*	*Lbs. per sq. in.*	*1,000 lbs. per sq. in.*	*Lbs. per sq. in.*	*Per cent.*
Tangile No. 1:									
Structural sizes	5	31.9	0.53	1.13	8,570	4,940	2,040	500	79
Small specimens	23	23.7	0.52	1.05	10,840	5,190	1,910	390	
Tangile No. 2:									
Structural sizes	5	33.3	0.49	0.97	7,790	4,060	1,860	320	80
Small specimens	22	26.3	0.46	0.81	9,700	4,620	1,680	340	
Tangile No. 3:									
Structural sizes	2	29.8	0.48	1.30	6,820	4,080	1,530	390	76
Small specimens	10	22.75	0.46	1.04	8,940	4,810	1,570	320	
Tangile No. 4:									
Structural sizes	4	24.9	0.46	0.45	6,710	2,690	1,690	240	68
Small specimens	15	18.8	0.47	1.08	9,850	5,030	1,600	350	
Tangile average:									
Structural sizes		29.9	0.49	0.96	7,640	3,940	1,780	360	76
Small specimens		29.9	0.48	0.99	10,000	4,910	1,690	350	
Apitong No. 1:									
Structural sizes	2	45.4	0.64	0.86	6,640	4,090	2,420	530	59
Small specimens	9	26.1	0.64	0.48	11,230	4,100	2,340	400	
Apitong No. 2:									
Structural sizes	4	53.3	0.58	0.51	6,690	3,290	2,030	390	61
Small specimens	11	22.1	0.64	1.17	10,910	5,180	2,040	390	
Apitong No. 3:									
Structural sizes	4	38.7	0.68	0.83	7,850	4,260	2,040	400	76
Small specimens	17	28.5	0.68	0.63	10,330	4,510	2,090	370	
Apitong No. 4:									
Structural sizes	4	36.9	0.64	0.63	6,120	3,530	1,960	240	61
Small specimens	19	24.9	0.65	1.05	9,980	5,850	1,803	350	
Apitong No. 5:									
Structural sizes	3	41.9	0.69	0.56	7,210	3,490	1,730	340	66
Small specimens	19	29.9	0.68	0.71	8,950	4,150	1,660	320	
Apitong No. 6:									
Structural sizes	1	40.6	0.69	0.69	5,220	3,120	1,290	290	51
Small specimens	3	21.7	0.69	0.28	10,190	3,500	1,870	360	
Apitong average:									
Structural sizes		42.8	0.65	0.68	6,820	3,630	1,900	360	62
Small specimens		25.5	0.66	0.72	10,080	4,550	1,970	370	
Apitong (from market):									
Structural sizes	4	48.7	1.56	1.19	7,870	4,400	1,890	540	80
Small specimens	13	21.1	0.56	1.14	9.790	5.800	1,840	380	
Guijo (from market):									
Structural sizes	4	63.3	0.66	3.13	11,660	8,020	2,360	730	91
Small specimens	19	37.1	0.64	1.55	12,810	7,680	2,140	460	

TABLE 15.—*Average results of bending tests of timber of structural sizes and small specimens*—Continued.

Species.	Tests.	Moisture.	Specific gravity oven dry, based on volume when green.	Modulus of elastic resilience.	Modulus of rupture.	Fiber stress at elastic limit.	Modulus of elasticity.	Greatest calculated longitudinal shear.	Ratio of the modulus of rupture of structural sizes and small specimens.
		Per cent.		*Lbs. per cu. in.*	*Lbs. per sq. in.*	*Lbs. per sq. in.*	*1,000 lbs. per sq. in.*	*Lbs. per sq. in.*	*Per cent.*
Lumbayan (from market):									
Structural sizes	3	27.2	0.49	1.06	6,070	3,910	1,590	370	66
Small specimens	14	21.8	0.50	0.89	9,200	3,620	1,520	330	----
Gisok (from market):									
Structural sizes	4	17.4	0.83	2.90	14,140	9,340	2,970	800	77
Small specimens	13	16.9	0.84	2.47	18,260	11,340	2,920	650	----
Borneo Camphor (Kapor):									
Structural size	1	55.3	0.57	1.47	7,610	5,840	2,260	360	58
Small specimens	5	55.3	0.57	1.47	13,400	6,550	2,070	470	----

TABLE 16.—*Average strength values for compression paralled to grain, compression perpendicular to grain, shear, and hardness*

[Test specimens, 2 by 2 by 8 inches.]

Specimen.	Compression parallel to grain.				Compression perpendicular to grain.					Shear.			Hardness load required to embed a 0.444-inch ball to one-half its diameter.	
	Test.	Moisture.	Fiber stress at elastic limit.	Maximum crushing strength.	Stress area.	Height.	Tests.	Moisture.	Fiber stress at elastic limit.	Tests.	Moisture.	Shearing strength.	End.	Side.
			Lbs. per sq. in.	*Lbs. per sq.in.*					*Lbs. per sq. in.*			*Lbs. per sq. in.*	*Lbs.*	*Lbs.*
Tangile No. 1	33	22.1	2,620	4,930	4	2	26	19.5	660	30	20.0	1,010	740	710
Tangile No. 2	19	18.8	3,380	4,810	4	2	22	20.1	590	22	18.6	870	860	700
Tangile No. 3	11	21.5	2,640	4,450	4	2	9	20.8	650	14	20.2	920	660	670
Tangile No. 4	19	20.1	2,990	4,700	4	2	16	21.8	840	24	18.6	1,030	650	630
Average		20.6	2,900	4,720				20.5	685		19.3	958	728	677
Apitong No. 1	6	22.3	2,580	4,600	4	2	6	26.3	740	13	17.9	1,300	1,230	1,050
Apitong No. 2	14	20.6	2,690	5,580	4	2	18	21.9	840	22	20.5	1,080	1,240	1,130
Apitong No. 3	6	20.30	3,330	5,720	4	2	11	26.1	830	29	19.7	1,140	1,240	1,080
Apitong No. 4	17	21.4	3,030	5,230	4	2	14	20.7	930	21	18.5	1,230		
Apitong No. 5	6	21.9	3,000	4,890	4	2	16	22.1	1,050	28	19.6	1,160	1,180	1,150
Apitong No. 6	2	21.2	2,750	5,690	4	2	5	21.0	970	7	19.1	1,210	1,330	1,080
Average		21.3	2,897	5,285				23.0	894		19.2	1,187	1,244	1,098
Guijo	19	24.20	3,990	6,280	4	2	14	17.61	1,130	20	15.2	1,400	1,270	1,210
Gisok	12	16.11	5,170	8,440	4	2	12	17.11	2,100	16	15.5	1,830	1,670	1,850
Lumbayan	10	21.65	2,900	5,310	4	2	10	18.60	840	14	20.7	1,160	860	660
Apitong	7	17.90	3,000	5,360	4	2	10	16.60	840	15	15.5	1,110	1,070	940
Borneo Camphor (Kapor)	5	55.30	2,970	6,200	4	2	5	55.30	850	5	55.3	483		

ILLUSTRATIONS

PLATE 1

Testing machine equipped for timber testing.

TEXT FIGURES

FIG. 1. Apparatus used for bending tests on large beams.
2. Deformation curve.
3. Deformation curve.
4. Apparatus used for testing small clear beams.
5. Apparatus used in making tests of compression parallel to grain.
6. Diagram for tests in compression parallel to grain.
7. Apparatus used in making tests in compression perpendicular to grain.
8. Typical load deformation diagram for tests in compression perpendicular to grain.
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10. Apparatus used in testing hardness of timber.
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16. Relation between dry weight and modulus of rupture obtained from tests on small clear beams.
17. Relation between dry weight and modulus of rupture obtained from tests on small clear beams.
18. Relation between dry weight and modulus of rupture obtained from tests on large beams.
19. Relation between dry weight and modulus of rupture obtained from tests on large beams.

PLATE 1. TESTING MACHINE EQUIPPED FOR TIMBER TESTING.

BIRDS OF ANTIQUE PROVINCE, PANAY, PHILIPPINE ISLANDS

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TWO PLATES

This paper records the observations of myself and two assistants on the birds of Antique Province, Panay. From Iloilo we reached Tibiao by steamer on May 8, 1918. As there was no forest whatever in this locality, we moved to Culasi in the vicinity of which and at Flores somewhat better collecting ground was found. We finally took a small sailing boat at Lipata, which transported us around the northwestern point of Panay to the town of Ibajay where we took a steamship for Manila.

Antique Province consists of a strip along the entire western side of Panay and includes also four small islands—Maralison, Batbatan, Manining, and Caluya. Its eastern boundary lies in a more or less continuous range of hills and mountains. In the northern and southern extremities this range approaches the coast so that the width of the province is less than 12 kilometers, but this gradually increases toward the center, in the region of Caritan and Bugason, where the eastern boundary is about 35 kilometers from the coast. If the four islands mentioned above be disregarded, the province seems extremely long for its width.

Except at the extremities the coast line is nearly straight, being thus very different from the outline presented by the northern and eastern coasts of Panay. On the entire coast of Antique Province Lipata Point, near Culasi, is the only place affording protection to vessels during storms from the south and the southeast. The water is deep close to shore along nearly the entire coast, so that at many places, when the sea is calm, small steamers can anchor just outside the surf and carry a stern line to the beach. These features combine to bring water transportation to a standstill during the southeast monsoon. A remarkable feature of this province is the great number of rivers, most of which are of necessity short, but many of them carry

so much water during rainy weather that all except very limited travel along the coast is rendered impossible.

With few exceptions there are high beaches of sand or gravel from San José de Buenavista to Pandan. Above high tide there is a scanty growth of strand plants among which a species of *Pandanus* is the most conspicuous. A short distance inland the land is usually lower than the beach and supports groves of coconuts or, near the mouths of some rivers, nipa palms. From this coastal strip to the hills there are level areas of varying width on which rice, sugar cane, and corn are grown. The forest has been stripped from the lower hills; here rice and corn are grown without irrigation and, in many places, on extremely steep and rocky ground. When one of these areas is not replanted, it becomes covered with a thick growth of tall grass. Occasional patches of forest can be seen on many hills. When one of these is examined, it is found that the trees and shrubs are growing on very steep hillsides or among bowlders of extremely rough coral crag. Progress through the latter type of forest is slow and tiresome and not without danger, for deep holes are often hidden by the leaves of the undergrowth. Bird collecting in this forest, except along paths, is useless, as the entire attention is required to secure safe footing.

The higher hills, which may be called mountains because of their steep slopes and broken sky line, in the vicinity of Culasi are well forested, and the summits are usually narrow ridges on which the mossy type of forest grows, down to about 900 meters' altitude. Chickadees, nuthatches, *Rhipidura albiventris*, *Edolisoma panayensis*, and *Culicicapa helianthea* were found in this forest, but fog was so prevalent that not a single clear day of observation was had.

The maps of this region are somewhat indefinite and incomplete with regard to the mountains. In Tibiao and in Culasi the highest elevation of a long range was pointed out as Mount Madjaas; this seems to be considered the highest mountain in this region, and it is probably the one marked Madia-ás on old maps. Because of weather conditions I could not see if there were other mountains higher than the one called Madjaas. An attempt was made to reach the summit of Madjaas from Flores by climbing a steep spur on the northeast side. At about 1,000 meters this became a knifelike ridge covered with typical mossy forest through much of which it was necessary to clamber on hands and knees. At about 1,500 meters a thicket of high coarse grass was encountered through which it would

have taken an entire day to cut a trail, and precipitous slopes on each side prevented going around the grass so I reluctantly returned to Flores.

We planned to climb the mountain from the south, but very rainy weather prevented the attempt.

On June 18 we visited Maralison Island, where we noted birds of the following species:

Streptopelia dussumieri.
Demigretta sacra.
Halcyon chloris.
Hirundo javanica.
Cisticola exilis.
Cyrtostomus jugularis.

On June 24 we visited Batbatan Island, where we were stormbound for five days by almost continuous rain and wind. On July 1 we were able to return to Culasi. Birds of the following species were noted on Batbatan Island:

Streptopelia dussumieri.
Sterna boreotis.
Charadrius fulvus.
Demigretta sacra.
Fregata aquila ?
Centropus javanicus.
Rhipidura nigritorquis.
Cisticola exilis.
Artamus leucorhynchus.
Cyrtostomus jugularis.
Anthus rufulus.
Oriolus acrorhynchus.
Lamprocorax panayensis.

During July we were able to do very little work because of almost continuous bad weather. The only steamer on the coast was stormbound at Lipata Point for a week, and travel by land was out of the question because of the numerous rivers.

In Flores, the only good collecting locality that we found, we were unable to do more than three days' work, and our collections from Antique are therefore not very satisfactory. The following species collected or seen by us are believed to be unrecorded from Panay:

Porphyrio pulverulentus.
Tachybaptus philippensis.
Charadrius fulvus.
Ægialitis peroni.
Heteractitis brevipes.
Heteropygia acuminata.
Fregata aquila ?
Elanus hypoleucus.
Ninox philippensis.
Tyto longimembris.
Caprimulgus manillensis.
Collocalia marginata.
Xantholæma roseum.
Hirundo striolata.
Muscicapula westermanni.
Copsychus mindanensis.
Kittacincla superciliaris.
Budytes leucostriatus.

The ornis of Panay is fairly well known and is practically the same as that of Negros. The only important difference is that *Phapitreron maculipectus, Oriolus steeri, Æthopyga bonita, Dasycrotapha speciosa, Halcyon moseleyi, Brachypteryx brun-*

neiceps, Planesticus nigrorum, and *Rhinomyias albigularis* are known to occur in Negros and have not been collected in Panay. The first four will probably be found in Panay when a collector finds good forest. *Halcyon moseleyi* is one of those rare species that cannot be looked for with confidence even where it is known to occur. The last three species can be expected only in forest at considerable altitude, and the chances of their discovery in Panay are very slight.

ENUMERATION OF SPECIES OF BIRDS OBSERVED IN ANTIQUE PROVINCE

Excalfactoria lineata (Scopoli).

Individuals of the island painted quail were flushed several times on grassy hills near Culasi.

Gallus gallus (Linnæus).

Male jungle fowls were heard in the forest near Culasi, at altitudes of from 200 to 500 meters; and a female with young was seen on June 14, at an elevation of about 400 meters.

Turnix fasciata (Temminck) ?

Button quails were flushed several times near Culasi, and a bird from which all the feathers had been removed was seen in the hands of a man at Tibiao. As no specimen was collected, there is the possibility that some species other than *T. fasciata* was seen.

Osmotreron axillaris (Bonaparte).

Specimens of this green pigeon were collected at Tibiao on May 13 and at Culasi on May 26.

Osmotreron vernans (Linnæus).

Three specimens of this species were killed at Culasi on July 18, and another, on July 28. This dove appears to be rare in Antique Province.

Phapitreron nigrorum Sharpe.

A female of this white-eared pigeon, with large ovules, was killed at Tibiao on May 9, and another specimen was killed at 800 meters' altitude near Culasi on May 19. A nesting female was collected near Culasi on May 30.

Muscadivores chalybura (Bonaparte).

An adult fruit pigeon in molt and a fully grown young bird of the year were collected between Culasi and Tibiao on July 22.

Columba griseigularis (Walden and Layard).

Four specimens of this beautiful wood dove, one of which was killed, were seen in a second-growth thicket near Culasi on May 26.

Streptopelia dussumieri (Temminck).

Specimens of Dussumier's dove, feeding on corn and rice, were killed near Tibiao on May 13. This species was rare near Culasi, and only three or four individuals were seen between Culasi and Pandan. We were informed that there were many doves on Maralison Island, but only three specimens of Dussumier's dove were seen. No other species of dove was found on Maralison. On Batbatan Island this species was very abundant; as it was feeding almost exclusively on rice, it was doing considerable damage.

Chalcophaps indica (Linnæus).

The bronze-winged dove was seen near Culasi.

Hypotænidia striata (Linnæus).

One male was collected at Culasi on June 19.

Poliolimnas ocularis (Ingram).

Poliolimnas cinereus McGregor, Man. Philip. Birds (1909) 73 (Philippine records).

Porzana cinerea ocularis Ingram, Bull. Brit. Orn. Club 29 (1911) 22.

The Philippine ashy crake was abundant at Culasi, where several specimens were collected; another was collected at Tibiao.

Ingram has separated the ashy crake of the Philippine Islands as a subspecies of *Porzana cinerea* and has validated Gray's name by giving the characters for the Philippine race. This race is said to be darker than *P. cinereus,* especially on the head; the gray tints on the head and the olivaceous tints on the back purer and more strongly contrasted with one another; the neck and breast conspicuously grayer and strongly washed with slate gray.

Sharpe[1] indicates two specimens collected by Cuming as "Types of *O. ocularis,*" with Philippine Islands as the locality. However, as Gray's name is a nomen nudum, the types of his species are of no interest unless designated as types by another author. Ingram designated neither type nor type locality for his subspecies. It is possible that two or more races of this rail may be found within the Philippine Islands; it would then

[1] Cat. Birds Brit. Mus. 23 (1894) 133.

be necessary to fix the type locality for *Poliolimnas ocularis*. It is strange that ornithologists continue to publish names and descriptions without paying attention to types and exact localities.

Gallinula chloropus (Linnæus).

The moorhen was abundant in a small marsh just outside of Culasi during May and the early part of June. When the rice fields became flooded these birds scattered over an immense area, and specimens were then obtained with difficulty.

Gallicrex cinerea (Latham).

A few specimens of the watercock were killed.

Porphyrio pulverulentus Temminck.

Specimens of the large blue gallinule were killed in a bit of marsh near Culasi. This species has not been previously recorded from Panay.

Tachybaptus philippensis (Bonnaterre).

One specimen of the Philippine grebe was collected near Culasi on June 16; the species has not been previously recorded from Panay.

Sterna boreotis (Bangs).

A few specimens of this large tern were seen about Batbatan Island; specimens collected there on June 27 were in full plumage, the crown being entirely black.

Charadrius fulvus (Gmelin).

A small flock of Eastern golden plovers was seen on Batbatan Island. Two specimens were killed near Culasi on July 6. This common migrant does not appear to have been recorded from Panay.

Ægialitis dubia (Scopoli).

Specimens of the little ringed plover were collected at Tibiao and at Culasi.

Ægialitis peroni (Bonaparte).

Malay sand plovers were the only shore birds seen during the long tramp from Culasi to Pandan and return; one male was killed near Sebaste on July 13. This species has not been recorded from Panay.

Heteractitis brevipes (Vieillot).

A female of this species was collected at Lipata on July 9; the species has not been recorded from Panay.

Actitis hypoleucos (Linnæus).

One specimen of the common sandpiper was collected at Tibiao in May.

Heteropygia aurita (Latham).

A small flock of sharp-tailed sandpipers was seen near Culasi on May 16. One female was very fat, and its ovary contained large ovules. The plumage of this specimen agrees well with the description of the breeding plumage and is indistinguishable from that of a female collected by me in Batan Island, Batanes, north of Luzon, on May 29, 1907. Panay is the fourth Philippine island from which this sandpiper is now known.

Rostratula capensis (Linnæus).

Specimens of the painted snipe were collected near Culasi.

Pyrrherodia manilensis (Meyen).

Specimens of this large heron were collected near Culasi.

Demigretta sacra (Gmelin).

A reef heron from Maralison, June 18, is almost entirely pure white. There are a few blackish feathers on the head, the neck, the wings, and the thighs. The neck is well sprinkled with blackish feathers, and the dark color is conspicuous on the axillars and the wing lining. This heron, while not abundant, is widely distributed in the Philippine Islands, but I do not remember having seen a white one before. An individual in the ordinary dark blue plumage was seen on Batbatan.

Nycticorax manillensis Vigors.

An immature specimen of the Philippine night heron was killed near Culasi on July 21.

Butorides javanica (Horsfield).

This small heron was seen near Culasi.

Ixobrychus astrologus Wetmore.

Ixobrychus sinensis McGregor, Man. Philip. Birds (1909) 178 (Philippine localities).

Ixobrychus sinensis astrologus Wetmore, Proc. Biol. Soc. Washington 31 (1918) 83 (Paete, Laguna, Luzon, type locality; and Panay).

This neat little bittern was abundant near Culasi; two specimens were preserved. Wetmore has separated the Philippine little yellow bittern as a subspecies with the following characters:

Characters.—Similar to *Ixobrychus sinensis bryani* (Seale) from Guam but smaller, bill in adult more slender, back darker, more brownish, under tail coverts somewhat more buffy, upper breast and foreneck slightly paler, back of neck slightly paler, more reddish.

The type is a specimen from Paete, Laguna Province, Luzon, collected by McGregor and Celestino.

Ixobrychus cinnamomea (Gmelin).

One specimen of the cinnamon bittern was collected near Culasi.

Dendrocygna arcuata (Horsfield).

Specimens of this tree duck were collected near Culasi on May 28 and on June 2.

Anas luzonica Fraser.

About the middle of May there were a few mallards in the marsh at Culasi, and pairs were found later at various places in the vicinity of that town.

Fregata aquila (Linnæus)?

On June 30 after four days of wind and rain a man-of-war bird was seen flying over Batbatan Island. On July 11 three more man-of-war birds were seen at Panganta, about 3 kilometers north of Culasi, and the next day a solitary bird of this species was seen over the beach at Sebaste. For seven days preceding July 11 there was heavy wind and much rain. Man-of-war birds may be expected to appear near the shore of any of the islands after a heavy wind. This genus has not been previously recorded from Panay. As we could not collect a specimen the species seen is in doubt.

Spilornis panayensis Steere.

One female of the Panay serpent eagle was collected at Culasi, and a young female was collected at Flores.

Haliastur intermedius Gurney.

A hawk of this common species, which was abundant at Tibiao and at Culasi, attempted to catch some small chickens, but at the noisy warning of two hens the chickens ran to the protection of a bamboo thicket. On another occasion one of these hawks succeeded in taking a small fish that a fisherman had left on the beach a short distance behind him.

Elanus hypoleucus Gould.

One specimen, a male, of this kite was collected at Culasi; the species has not been previously recorded from Panay.

Ninox philippensis Bonaparte.

A female of the Philippine hawk owl was collected at Culasi on May 21. This species has not been previously recorded from Panay.

Tyto longimembris (Jerdon).

The dried remains of an owl found on the road near Sebaste were easily recognized as those of a grass owl. This species has not been previously recorded from Panay.

Eurystomus orientalis (Linnæus).

The oriental roller was as abundant in Panay as it is in many other parts of the Philippine Islands.

Halcyon gularis (Kuhl).

Common at Tibiao and at Culasi.

Halcyon chloris Boddaert).

Common at Tibiao and at Culasi and noted on Maralison Island.

Penelopides panini (Boddaert).

Hornbills were very scarce in the localities visited by us, and only one specimen was collected.

Merops americanus P. L. S. Müller.

One specimen of the chestnut-headed beebird was collected at Culasi.

Caprimulgus manillensis Walden.

A specimen of the Manila nightjar was killed on the ground in a second-growth thicket on May 27. No species of this genus has been previously recorded from Panay.

Collocalia troglodytes Gray.

Swiftlets of this species were seen about grassy hills near Culasi at about 700 meters' altitude.

Collocalia marginata Salvadori.

About a dozen nests of Salvadori's swiftlet were found plastered to the walls of a small cave near Tibiao at 130 meters' altitude. One bird was caught on the nest with an insect net. The nest is composed of fibers of *Usnea* species and a few other fine plant stems, fastened together and to the rock wall by means of a small quantity of the glutinous substance that is

characteristic of the nests of many species of *Collocalia*. The nest is 3 centimeters deep, outside; 6.5 centimeters in greatest diameter (parallel to the supporting surface); and 5 centimeters from back to front—that is, the diameter at right angles to the supporting surface. The side that was against the rock is somewhat flattened and wings of the glutinous substance, attached to the rock and extending 2 centimeters from each side of the nest, serve as additional support. Other nests from this cave are composed of fine plant stems fastened together and to the rock wall in the usual manner.

In each of three sets of eggs collected one egg was slightly incubated and the other egg was noticeably more advanced in incubation. The eggshells are pure, dull white and unspotted. Measurements in millimeters are as follows: 17 by 11.4, 17.3 by 11; 16.5 by 10.6, 16.4 by 10.3; 16.4 by 10.2, 16.3 by 10.6.

Salvadori's swiftlet has not been previously recorded from Panay.

Cocomantis merulinus (Scopoli).

This common cuckoo was noted at Tibiao and at Culasi. A nearly full-grown young was killed near Culasi on July 28.

Centropus viridis (Scopoli).

This species was noted at Culasi.

Centropus javanicus (Dumont).

This species was noted at Culasi and on Batbatan Island.

Xantholæma roseum (Dumont).

This barbet was fairly abundant in the forest on hills near Culasi, but the coral rock on which the trees grow made it difficult to get near the birds. However, a few specimens were collected, June 3 to 14. The species has not been previously recorded from Panay.

Thriponax hargitti Sharpe.

One specimen, a female, was taken near Culasi at 600 meters' altitude.

Pitta erythrogaster Temminck.

Several specimens were taken near Culasi.

Hirundo javanica Sparrman.

This species was noted at Culasi and on Maralison Island.

Hirundo striolata Boie.

A few pairs of mosque swallows were building nests in the small cave near Tibiao where *Collocalia marginata* was found nesting. No nest appeared to be completed on May 13. This swallow has not been previously recorded from Panay.

Cyornis philippinensis Sharpe.

Specimens of this species were collected at Culasi.

Muscicapula westermanni Sharpe.

A specimen of this mountain flycatcher was collected at Flores on June 7. This species has not been previously recorded from Panay.

Hypothymis occipitalis (Vigors).

This widely distributed species was noted near Culasi, where one specimen was collected.

A nest of this flycatcher containing two heavily incubated eggs was found near Flores on June 8. It was securely saddled in the upright fork of a small tree. The principal material is small rachises of some compound leaf; the interior has a thin lining of fine fibers or grass. On the outside are a few bits of grass, leaves, strands of scale moss, small white masses that seem to be insects' cocoons, and possibly material from certain scale insects or leaf hoppers. The whole is held together by very slender threads that may be cobwebs. The nest is deep, both inside and outside, as is characteristic of the nests of many of the small flycatchers; but it is not so neatly finished, especially about the rim, as in some of the better examples of the nests made by members of this family. Measurements of this nest in centimeters are: Outside depth, 7; inside depth, 3.5; outside diameter, 6.5; inside diameter, 4.5.

The eggshells are smooth and very slightly glossy; their ground color is uniform, pale ivory yellow; the markings are dots and small irregular spots of light chestnut, most of which are near the larger end of the egg, but they do not form a zone. On one egg the markings are concentrated to form about one-third of a zone near the larger end, while the opposite side of the egg has scarcely any marks. These two eggs measure, in millimeters, respectively, 17.5 by 13.0 and 16.7 by 12.8.

Rhipidura albiventris Sharpe.

A pair of specimens of this forest flycatcher was collected near Culasi in mossy forest at 1,000 meters' altitude.

Rhipidura nigritorquis Vigors.

This species was noted at Tibiao and at Culasi and on Batbatan Island.

Culicicapa helianthea (Wallace).

A male of this beautiful yellow flycatcher was collected at 800 meters' altitude near Culasi, and a breeding pair was collected near Flores on June 6.

Artamides panayensis Steere.

This species was found in the hill forests near Culasi; one specimen was preserved.

Edolisoma panayense Steere.

Two males and a female of the Visayan cuckoo shrike were collected near Culasi in the mossy forest at 1,000 meters' altitude.

Lalaga niger (Forster).

This species was noted at Culasi.

Iole guimarasensis Steere.

Steere's bulbul was not abundant in Panay; it was noticed at Tibiao, and one specimen from Culasi was preserved.

Pycnonotus goiavier Boie.

This common species was noted at Tibiao and at Culasi. A nest of *Pycnonotus goiavier* found near Flores on June 8 contained two heavily incubated eggs. The nest is compactly made of rootlets and grass stems; on the bottom are several broad pieces of plants like the leaves of grasses. The lining consists of fine grasses. This nest fits neatly into one of the cardboard boxes in which twenty-five 12-gauge shotgun shells are packed, so that its outside dimensions are about those of this box, namely, 6 by 10.5 centimeters.

The eggshell is smooth and slightly glossy. The ground color is shell pink, but this is extensively obscured by the heavy markings, which form almost a solid mass of color near the larger end of the shell. These markings are mahogony red and burnt sienna, the undershell markings are liver brown and seem to be deeply embedded. The measurements in millimeters of these two eggs are 22.4 by 16.4 and 21.3 by 16.5.

Copsychus mindanensis Wagler.

This species, not previously recorded from Panay, was noted near Tibiao on May 9.

Kittacincla superciliaris Bourns and Worcester.

Cittocincla superciliaris BOURNS and WORCESTER, Minnesota Acad. Nat. Sci., Occ. Papers 1 (1894) 23.

Cittocincla nigrorum GRANT, Ibis (1896) 547 (Negros).

Kittacincla superciliaris MCGREGOR, Philip. Journ. Sci. § D 6 (1911) 44 (Negros).

I have already suggested that specimens of *Kittacincla* from Masbate (*superciliaris*) and from Negros (*nigrorum*) seemed to represent one species. I have before me one male from northern Negros, one male from Tibiao, two males from Masbate, and six males from Culasi, Panay, and I do not see that these differ in any way. The "partially concealed patch of white feathers in the middle of the lower back" is a variable character; it may be absent or may consist of a small white patch on one web of one or two feathers. Therefore, I believe that the *Kittacincla* of the central Philippines (Negros, Guimaras, Panay, Masbate, and Ticao) is *Kittacincla superciliaris*. No specimen of this genus has been previously recorded from Panay, and none is known from Guimaras.

Kittacincla superciliaris is one of the most distinct species discovered by the Menage Expedition. It was described from Masbate specimens. In Panay we found it rather common in the small forest growing on coral-limestone hills near Culasi; but it was very difficult to collect, and each specimen cost a day's patient hunting. On only one day were two specimens secured. Only one of our specimens is marked as a female, and this is doubtless a mistake as its plumage is not different from that of the others. A female from Negros agrees with Grant's description of the female. While we were at Culasi this species was breeding, and the females were probably on their nests and for this reason were not seen.

This species should be called Visayan shama rather than white-eyebrowed shama, as the eyebrow stripe is practically as conspicuous in the Luzon species.

Pratincola caprata (Linnæus).

This species was noted at Tibiao and at Culasi.

Orthotomus castaneiceps Walden.

This cheerful little tailor bird is one of the most abundant species along the coast of Antique Province. From the steamer it was heard singing at San José and at Bugasong, and it was a noticeable element of the lowland avifauna from Tibiao to Culasi and farther north.

At Tibiao a nest of the tailor bird, containing two fresh eggs, was found on May 15. The nest is composed of soft cottony and silklike fibers with a few bits of fine grass on the outside. It is fastened to and suspended among three leaves; the leaves are fastened to it in the classical tailor bird way by means of threadlike fibers. The nest is 6 centimeters deep and about the same in diameter.

The eggshells are smooth, white, and glossy. The markings are rather numerous dots and small blotches of liver brown to chestnut brown. Undershell markings are numerous and nearly as distinct as those on the surface. The markings are more numerous on the larger half of the shell, but do not form a distinct zone. The measurements of the eggs in millimeters are 16.0 by 11.2 and 17.2 by 12.0.

Cisticola exilis (Vigors and Horsfield).

This species was noted at Tibiao and at Culasi and on Batbatan and Maralison Islands.

A nest of *Cisticola exilis*, containing three fresh eggs, was found near Culasi on June 20. It was supported among large grass stems. It is composed of a loosely felted mass of the soft hairy spikelets of cogon (*Imperata*); on the outside are a few grass leaves and several large broad leaves; the latter are fastened together and held against the nest by means of threadlike fibers, which pass through holes in the leaves in the same manner as in the nests of tailor birds. The nest is about 8 centimeters deep and 6 centimeters in diameter, outside measurements.

The eggshell is smooth and very slightly glossy. The ground color is uniformly pale Nile blue. Most of the markings are rather large, somewhat irregular spots, mostly near the larger end of the shell, but without indication of a zone. The smaller markings are scattered spots and pin-point dots. All of the surface markings are liver brown to chestnut brown, the undershell markings are lighter brown. The measurements of the eggs in millimeters are 16.0 by 11.8, 15.7 by 12.1, and 15.7 by 12.0.

Megalurus tweeddalei McGregor.

Megalurus ruficeps GRANT and WHITEHEAD, Ibis (1898) 240, pl. 5, fig. 7 (egg).

This species was seen near Tibiao on May 9, and a young bird was collected at Culasi on May 26.

On June 1 a nest containing three heavily incubated eggs was found in the hills near Culasi. The shell is smooth and slightly glossy; general color pale pinkish buff; dots and irregular spots of liver brown, chocolate, and black are most numerous in a zone near the larger end; undershell markings numerous. The measurements in millimeters are 22.2 by 16.0, 22.0 by 15.8, and 21.8 by 16.1. These eggs do not resemble the figure given by Grant and Whitehead. The nest consists of an inner part composed of fine grass, surrounded by a large quantity of broad grass leaves very loosely put together; the entrance is at one side and is overhung by part of the outer broad-leaf material. The nest is very bulky; from back to front it measures at least 25 centimeters due to the projecting outer material. As the nest was placed in a thick growth of cogon (*Imperata*) it is considerably compressed and is only about 7 centimeters thick at right angles to the longest diameter. From top to bottom it measures about 15 centimeters.

Acanthopneuste borealis (Blasius).

This widely distributed migrant was noted at Tibiao on May 9.

Artamus leucorhynchus (Linnæus).

This swallow shrike was noted at Tibiao and was abundant about the plaza in Culasi; it was also seen on Batbatan Island.

Pardaliparus panayensis Mearns.

Pardaliparus elegans panayensis MEARNS, Proc. U. S. Nat. Mus. 51 (1917) 57.

Although titmice were frequently seen in the vicinity of Tibiao and Culasi, only two specimens were preserved; one is a female in worn plumage, the other is a young, yellow-throated bird of the year.

Mearns reviewed the genus as it exists in the Philippine Islands and recognized seven subspecies. There is certainly much difference between the large pale birds (*Pardaliparus edithæ* McGregor), of Calayan Island, at the northern limit of the Philippine range of this genus, and the small dark birds of some of the southern islands. It will be necessary to have a large series of adult birds in fresh plumage before the ranges of the various forms can be defined.

Callisitta œnochlamys (Sharpe).

Nuthatches were seen in the mossy forest at 1,000 meters' altitude near Culasi.

Zosterops nigrorum Tweeddale.

A few silvereyes were obtained at Tibiao and at Culasi.

Dicæum hæmatostictum Sharpe.

Specimens of this beautiful flowerpecker were collected at Tibiao and at Culasi.

Æthopyga magnifica Sharpe.

One male specimen of this truly magnificent species was collected at Flores; the species was not seen in any other locality in Panay.

Cinnyris guimarasensis Steere.

One male specimen of this rare sunbird was collected at Flores.

Cyrtostomus jugularis (Linnæus).

An incomplete nest of this sunbird was seen at Tibiao on May 8, and the species was abundant near Tibiao, Culasi, and other localities visited. It also occurs on Maralison and Batbatan Islands.

Budytes leucostriatus Homeyer.

This species was noted near Tibiao early in May. The species has not been previously recorded from Panay.

Anthus rufulus Vieillot.

This pipit was seen near Culasi and on Batbatan Island; one specimen was preserved.

Munia jagori Martens.

This species was noted near Tibiao and Culasi; four specimens were preserved at the latter locality.

A nest of *Munia jagori*, containing five slightly incubated eggs, was found near Culasi on May 23. The nest is large considering the size of the bird; it is nearly spherical, with a diameter of about 15 centimeters. The entrance is a hole 2.5 centimeters in diameter above the center on one side and is slightly protected by a roof of grass. The nest is so deep that it is difficult to remove the eggs except with the aid of a spoon. The entire nest is composed of grasses—fine grass inside and broad grass leaves outside.

The eggshells are smooth and dull; they are white and without markings. Their measurements in millimeters are 16.4 by 11.9, 14.4 by 11.2, 15.0 by 11.4, 15.5 by 11.9, and 15.0 by 11.1.

Oriolus acrorhynchus Vigors.

The Philippine oriole was fairly common near Tibiao and Culasi and was noted on Batbatan Island.

Dicrurus mirabilis Walden and Layard.

This species was not abundant in the parts of Panay visited by us. Two specimens were collected at Culasi.

Sarcops melanonotus Grant.

Two specimens of the bald starling from Culasi belong to the black-backed form of *Sarcops*.

Lamprocorax panayensis (Scopoli).

This starling was noted as abundant between Tibiao and Culasi, and on May 9 it appeared to be nesting in buri palms. It occurs also on Batbatan Island.

Corone philippina (Bonaparte).

The Philippine crow was seen along the road between Tibiao and Pandan, but the species does not appear to be as abundant as in many other islands.

ILLUSTRATIONS

PLATE 1

Map of the Philippine Islands.

PLATE 2

A relief map, showing Panay, Guimaras, and a part of Negros. The elevations are exaggerated.

PLATE 1. THE PHILIPPINE ISLANDS.

PLATE 2. PANAY, GUIMARAS, AND A PART OF NEGROS. THE ELEVATIONS ARE EXAGGERATED.

CHIRONOMIDES DES PHILIPPINES ET DE FORMOSE

Par J. J. KIEFFER

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Les Diptères dont il sera question dans ce travail, ont été recueillis les uns, aux îles Philippines, les autres, à l'île de Formose. Les premiers ont été capturés à la lumière, par M. Baker, professeur à l'Université des Philippines; les seconds ont été recueillis à l'île de Formose, par M. Sauter et sont conservés au Musée entomologique de Berlin-Dahlem. Aucun représentant de la famille des Chironomides n'avait été décrit jusqu'ici pour les Philippines. Quant aux Chironomides de Formose, j'en ai traité dans quatre travaux différents.[1]

CERATOPOGONINÆ

Genus CERATOPOGON Meigen

Subgenus Prohelea Kieffer

1. Bord antérieur de l'aile blanc, avec un point blanc sur la cellule radiale; 11e article antennaire du ♂ aussi long que les deux suivants réunis ..... C. (P.) chrysothrix sp. nov.

Bord antérieur de l'aile sans point blanc; 11e article antennaire du ♂ seulement d'un tiers plus long que le 12e... C. (P.) fuscimanus sp. nov.

[1] 1° Tendipedidæ (Chironomidæ) von Formosa, Supplementa Entomologica, 1 (1912) 27–43, pl. 2 et 16 fig. dans le texte. 2° Tendipedides (Chironomides) de Formose, Ann. Mus. Hung. 14 (1916) 81–121, 23 fig. (Dans ce travail, les figures 12 et 13 ont été interverties; la fig. 12 représente le dernier article du tarse antérieur de *Bezzia kerteszi* ♀ et non celui de *Palpomyia spinifera;* la fig. 13 au contraire représente le dernier article du tarse antérieur de *Palpomyia spinifera* ♀ et non pas de *Bezzia kerteszi*). 3° Tendipedidæ von Formosa, Supplementa Entomologica 5 (1916) 114–117. 4° Chironomides d'Asie et d'Afrique conservés au Museum national hongrois de Budapest, Ann. Mus. Hung. 16 (1918) 31–136, 48 fig. dans le texte. Dans ce travail, à la page 135, *Leptoconops flavipennis* et *hyalinipennis* ont été mis, par suite d'une confusion, dans le genre *Holoconops;* ces deux insectes reviennent au genre *Schizoconops*. Dans un autre travail, paru dans la même Revue et intitulé Chironomides d'Amerique 15 (1917) 292–364, 48 fig., il se trouve une erreur à la page 364; le type du genre *Microhelea* est *Atrichopogon microtomus* Kieff. page 299 et non pas *A. tropicus*, qui n'existe pas; ce dernier nom avait été employé primitivement dans mon manuscrit, mais remplacé ensuite par celui de *A. microtomus* avant l'impression; j'avais oublié de faire le même changement á la page 364.

Ceratopogon (Prohelea) chrysothrix sp. nov.

Mâle et femelle.—Brun. Antennes du mâle jaune brunâtre, articles 11–14 ensemble à peine plus longs que 2–10 réunis, panache fauve, 2e article globuleux dans sa moitié distale, aminci en pétiole dans sa moitié basale, 3–10 subglobuleux, sans col, graduellement moins gros; 11e le plus long, aussi long que les deux suivants réunis, subcylindrique, à base renflée sur un côté et portant des poils du panache, 12e presque deux fois aussi long que le 10e, un peu plus long que le 13e, tous deux subcylindriques, à base globuleuse et portant un verticille de longs poils, mais non pas des poils du panache, 14e plus gros que les trois précédents, aussi long que le 12e, cylindrique, sans verticille, avec un stylet terminal. Antennes de la femelle fauves, articles 2–9 ensemble presque deux fois aussi longs que les 5 derniers réunis, glabres, subglobuleux, à extrémité amincie en un col transversal; verticilles composés de 20 poils bruns et presque deux fois aussi longs que l'article; soies sensorielles blanches, obtuses, au moins d'un tiers plus courtes que les poils des verticilles et deux fois aussi grosses qu'eux; articles 10–14 poilus, serrés, sans col, 10–13 subcylindriques, pas plus longs ou à peine plus longs que gros, avec un verticille basal composé de quelques poils longs, 14e article à peine plus gros, aussi long que les deux précédents réunis, terminé par un stylet. Thorax plus haut que long, brun roux, couvert dorsalement de poils denses, appliqués et d'un jaune d'or. Balanciers d'un blanc pur. Aile sombre, à cause de la pilosité noirâtre; bord antérieur brun noir, avec une petite tache d'un blanc de lait sur la cellule radiale, qu'elle dépasse un peu; à partir de là, un trait brun noir longe le bord jusque près de la pointe alaire; nervures brun noir, radiale et cubitale blanches dans la tache, confluentes dans leurs deux tiers proximaux qui sont brun noir, cellule radiale unique, très petite, subcirculaire, n'atteignant pas le milieu du bord, fourche intercalée avec pétiole. Pattes jaune clair, à longs poils dorsaux, moitié distale du fémur postérieur, large anneau près de la base du tibia et le métatarse brun noir; 2e article du tarse postérieur de deux tiers plus long que le 1er, 3e aussi long que le premier, d'un tiers plus long que le 4e, 5e le plus court, pas trois fois aussi long que gros; crochets égalant la demi-longueur de l'article, empodium atteignant au moins l'extrémité des crochets. Abdomen du mâle grêle, brun, tergites à large bande transversale jaune; abdomen de la femelle brun, à poils jaunes et épars, ventre jaunâtre.

Longueur, ♂, 2 millimètres; ♀, 1.5 millimètres.

Formose, Taihoku, 4 ♂♂, 1 ♀; Philippines, Luzon, Laguna, Los Baños, 2 ♀♀.

Ceratopogon (Prohelea) fuscimanus sp. nov.

Mâle.—Brun noir. Bouche rousse, aussi longue que la hauteur de la tête. Panache brun noir et dense; articles 2–10 à peine plus longs que 11–14 réunis, subglobuleux et sans col, graduellement plus minces; 11e seulement d'un tiers plus long que le 12e, mince et subcylindrique, sa base renflée sur un côté et portant un anneau de poils du panache; 12e conformé comme le 11e, sauf que la base est renflée en globule et porte un verticille de quelques longs poils, mais pas de poils du panache; 13e et 14e plus gros, subcylindriques, à base munie d'un verticille de longs poils, mais non renflée, le 13e d'un tiers plus court que le 12e, 14e égalant à peine le 12e, terminé par un stylet. Thorax brun roux, mesonotum à poils jaunes peu abondants (peut-être tombé en partie). Balanciers blancs. Aile hyaline, non lobée, à poils gris, cubitale n'atteignant pas le milieu, entièrement noire ou brun noir, soudée à la radiale, sauf au tiers distal, qui forme une cellule radiale très petite et subcirculaire, radiale brun noir, les autres nervures pâles, rameau antérieur de la discoïdale aboutissant un peu avant la pointe alaire, rameau postérieur un peu en arrière d'elle, bifurcation de la posticale sous l'extrémité de la cubitale, son rameau antérieur continue la direction de la tige. Pattes d'un jaune clair, sauf les hanches, à longs poils dorsaux, les 4 tarses antérieurs brun noir, fémur postérieur à peine obscurci; métatarse antérieur égalant le 2e article, métatarse posterieur d'un tiers plus court que le 2e article, 5e article le plus court, crochets et empodium d'égale longueur.

Longueur, 2 millimétres.

Formose, Hokuto.

Genus ATRICHOPOGON Kieffer [2]

1. Corps noir brillant ..... 2.
   Corps brun, thorax pruineux de gris; articles antennaires 3–9 transversaux ..... A. pruinosus sp. nov.
   Corps jaune ou rouge ..... 3.

[2] Ce genre diffère, outre les caractères indiqués dans mon travail: Chironomides d'Europe (Ann. Budapest), par l'antenne de la ♀, dont les verticilles sont moins denses et se composent seulement de 5 ou 6 poils en règle générale.

2. Pattes roux pâle, hanches brun noir, extrémité de l'abdomen roux clair (♀) ..... **A. hæmorrhoidalis sp. nov.**
   Pattes jaune pâle ou jaune blanchâtre; abdomen de la ♀ noir en entier ..... **A. insularis sp. nov.**
3. Jaune sale; aile de la ♀ à soies microscopiques, par endroits à soies plus longues; article 10 de l'antenne 2 fois aussi long que gros, 3–9 fortement transversaux ..... **A. flavidus sp. nov.**
   Vitellin; articles antennaires 3–9 globuleux, 10e presque 5 fois aussi long que gros ..... **A. flavellus Kieff.**
   Rouge; aile de la ♀ couverte uniformément de soies assez longues.... 4.
4. Mat; 2e cellule radiale de la ♀ un peu moins de deux fois la 1e. **A. rufescens sp. nov.**
   Brillant; 2e cellule radiale de la ♀ 2.5 fois aussi longue que la 1e. **A. ruber Kieff.**

Atrichopogon pruinosus sp. nov.

Femelle.—Brun. Tête et thorax pruineux de gris. Bouche égalant la demi-hauteur de la tête. Antennes brunes, articles 10–14 ensemble presque deux fois aussi longs que 2–9 réunis, subcylindriques, graduellement un peu plus longs, le 10e aussi long que les trois précédents réunis, le 14e avec un stylet terminal; 2e transversal dans sa moitié distale, graduellement aminci en pétiole dans sa moitié proximale; 3–9 assez transversaux, verticilles de 6 poils, ceux-ci pas plus minces et un peu plus longs que les soies sensorielles. Scutellum jaune roussâtre. Balanciers blancs. Aile hyaline, peu lobée, à soies microscopiques, sauf au bord distal qui porte des soies plus longues, depuis l'extrémité du rameau antérieur de la posticale jusqu'à la fourche intercalée inclusivement; nervures brunes, cubitale 2.5 fois aussi longue que la radiale, 2e cellule radiale plus large que la 1e, discoïdale brièvement pétiolée, bifurcation de la posticale un peu distale de celle de la discoïdale, le rameau postérieur très oblique, le rameau antérieur un peu plus distant de la pointe alaire que la cubitale. Pattes jaune blanchâtre, sans longs poils.

Longueur, 1.5 millimètres.

Formose, Taihoku.

Atrichopogon hæmorrhoidalis sp. nov.

Femelle.—Noir brillant. Yeux confluents. Bouche égalant la demi-hauteur de la tête. Antennes roux brun, scape jaune, articles 10–14 ensemble d'un tiers plus longs que 2–9 réunis, subcylindriques, graduellement un peu plus longs, le 10e pas plus long que les deux précédents réunis, le 14e double du 10e terminé par un stylet; 2e pas plus gros et à peine plus long que le 3e, graduellement aminci à sa base, 3–9 aussi longs que gros, subcylindriques, verticilles à 6 poils pas plus minces et un peu

plus longs que les soies sensorielles. Balanciers blancs. Aile hyaline, paraissant glabre à la loupe, à soies microscopiques seulement, peu lobées, nervures antérieures grosses et brunes, cubitale deux fois la radiale, plus distante de la pointe alaire que le rameau antérieur de la posticale, discoïdale brièvement pétiolée, bifurcation de la posticale un peu distale de celle de la discoïdale, son rameau inférieur oblique, le supérieur continuant la direction de la tige. Pattes roux pâle, hanches brun noir, métatarse postérieur distinctement plus court que les 4 articles suivants réunis. Extrémité de l'abdomen roux clair.

Longueur, 1.5 millimètres.

Formose, Hokuto.

Atrichopogon insularis sp. nov.

Mâle et femelle.—Noir brillant. Bouche égalant la demi-hauteur de la tête. Antennes de la ♀ brunes, articles 10–14 ensemble presque deux fois aussi longs que 2–9 réunis, subcylindriques, graduellement un peu amincis distalement, á poils épars assez longs, le 14e le plus long, terminé par un stylet; le 2e distinctement plus gros et plus long que le 3e, aminci au quart basal; 3e à peine transversal, 4–9 aussi longs ou un peu plus longs que gros, verticilles à 5 ou 6 poils à peine plus longs et aussi gros que les soies sensorielles. Balanciers blancs. Aile de la ♀ subhyaline, pas distinctement lobée, à soies assez longues partout, cubitale 2.5 fois aussi longue que la radiale, à peine plus proche de la pointe alaire que le rameau antérieur de la posticale, bifurcation de la discoïdale un peu distale de la transversale, celle-ci située avant le milieu de l'aile, comme d' ordinaire, bifurcation de la posticale sous l'extrémité de la 1e cellule radiale, rameau inférieur subperpendiculaire, fourche intercalée longuement pétiolée. Aile du ♂ seulement à soies microscopiques, cubitale à peine plus de deux fois la radiale, un peu plus loin de la pointe alaire que le rameau antérieur de la posticale. Pattes jaune pâle ou jaune blanchâtre, tarses un peu plus sombres. Le ♂ a les antennes brunes, le panache brun noir, dense, gris à l'extrémité, les 4 derniers articles ensemble de moitié plus longs que 2–10 réunis, le 2e plus mince que le 3e, mais de moitié plus long, aminci fortement dans sa moitié basale, 3–10 subglobuleux, avec un verticille de poils du panache, à col transversal et à peine distinct; 11e deux fois le 10e, cylindrique, à base grossie sur un côté et portant des poils du panache; 12e le plus long, deux fois un quart aussi long que le 11e, subcylindrique comme les deux suivants et ayant comme eux un trait transversal près de la base,

portant un verticille de poils; 13e de trois quarts plus que le 11e, à peine plus long que le 14e, celui-ci avec un stylet. Pince du ♂ jaune ou rousse, à longs poils gris; articles terminaux presque aussi longs que les basaux, presque droits, graduellement un peu amincis, extrémité un peu courbée et faiblement bidentée.

Longueur, ♂, 1.5 millimètres; ♀, 1–1.5 millimètres.

Formose, Hokuto, Taihoku et Daitotei.

Atrichopogon flavidus sp. nov.

Femelle.—Jaune sale. Tête transversale vue de devant. Yeux confluents. Bouche égalant au moins la hauteur de la tête, pièces buccales dentelées. Palpes jaunes, peu longs, 1er article cylindrique, à peine plus court que le 2e, celui-ci deux fois aussi long que gros, un peu grossi médialement aprés son milieu, et portant à cet endroit un organe sensoriel subcirculaire, 3e et 4e ensemble à peine plus longs que le 3e et un peu plus minces, le 3e largement uni au 4e et un peu plus court que lui. Antennes brunes, articles 10–14 ensemble presque deux fois aussi longs que 2–9 réunis, subcylindriques, graduellement un peu amincis distalement, à poils épars pas plus longs que la grosseur des articles, sauf ceux de la base, 10–12 égaux, un peu plus de deux fois aussi longs que gros, 13e un peu plus long, 14e le plus long, muni d'un stylet terminal; 2e article beaucoup plus gros que le 3e et plus long, 3–9 assez fortement transversaux, verticilles à 6 poils bruns pas plus longs et pas plus minces que les soies sensorielles, celles-ci hyalines. Balanciers blancs. Aile hyaline, non lobée, à soies microscopiques, des soies plus longues se trouvent sur toutes les nervures, y compris celles de la fourche intercalée, sur l'espace entre l'embouchure de la cubitale et de la fourche intercalée, sur la cellule formée par celle-ci, sur la cellule discoïdale antérieure sauf la base et les côtés, sur la moitié distale de la cellule discoïdale postérieure, sur le milieu de la cellule posticale, sur la cellule anale, sauf l'extrémité distale et le bord antérieur, 2e cellule distale deux fois et demie aussi longue que la 1e, cubitale distale de la pointe alaire de sa longueur, discoïdale à peine pétiolée, bifurcation de la posticale un peu plus distale que celle de la discoïdale, rameau antérieur aussi distant de la pointe alaire que la cubitale. Pattes jaunes, sans longs poils, non grossies, métatarse postérieur aussi long que les 3 articles suivants réunis, 2–4 graduellement un peu raccourcis, 4e et 5e subégaux, un peu plus longs que gros.

Longueur, 1.5 millimètres.

Philippines, Luzon, Laguna, Los Baños.

Atrichopogon flavellus Kieff.

Femelle.—Articles antennaires 3–9 globuleux, 10 presque cinq fois aussi long que gros; verticilles à 6 poils.

Philippines, Luzon, Laguna, Los Baños.

Atrichopogon rufescens sp. nov.

Femelle.—Rouge et mat. Tête manque. Balanciers blancs. Aile subhyaline, non distinctement lobée, uniformément couverte de soies assez longues, 2e cellule radiale un peu moins de deux fois aussi longue que la 1e, cubitale $1\frac{2}{3}$ fois plus long que la radiale, discoïdale brièvement pétiolée, bifurcation de posticale un peu plus distale que celle de la discoïdale. Pattes jaune pâle, grêles, cils du tibia postérieur deux fois aussi longs que sa grosseur, métatarse postérieur au moins aussi long que les 4 articles suivants réunis.

Longueur, 1 millimètre.

Formose, Taihoku.

Atrichopogon ruber Kieff.

Femelle.—Roux brillant, flagellum brun, balanciers blancs, pattes jaune pâle, abdomen roux brun. Métatarse postérieur plus long que les 4 articles suivants réunis.

Formose, Taihoku, Hokuto.

Genus CULICOIDES Latreille

1. Articles antennaires 3–9 de la ♀ globuleux, taches alaires formant 3 rangées transversales..... C. alboguttatus sp. nov.

- Articles antennaires 5–9 de la ♀ au moins deux fois aussi longs que gros, taches alaires ne formant pas des rangées transversales. C. philippinensis sp. nov.

Culicoides alboguttatus sp. nov.

Femelle.—Brun, y compris les balanciers. Bouche aussi longue que la hauteur de la tête. Articles 10–14 des antennes d'un cinquième plus longs que 2–9 réunis, graduellement un peu amincis distalement, à poils épars plus longs que la grosseur des articles, le 10e aussi long que les deux précédents réunis, les suivants graduellement un peu plus longs, 14e dépassant d'un tiers la longueur du 13e, sans stylet; article 2e plus gros et un peu plus long que le 3e, aminci à l'extrême base, 3–9 subglobuleux et glabres, verticilles à 5 ou 6 poils, ceux-ci plus de deux fois aussi longs qu'un article, soies sensorielles plus courtes qu'un article. Mesonotum avec deux lignes longitudinales et rapprochées grises, divergeant en arc au bout antérieur; de chaque côte, une petite ligne longitudinale et interrompue grise, forme deux petits

traits. Aile enfumée, avec trois rangées transversales de petites taches blanches et circulaires; rangée distale en forme d'arc, touchant presque le bord distal de l'aile, formée de 3 taches, l'une à l'extrémité de la cellule cubitale, l'autre à l'extrémité de la cellule discoïdale antérieure, la 3e à l'extrémité de la cellule discoïdale postérieure; 2e rangée composée de 5 taches, la 1e sur le bord antérieur, à l'extrémité de la cubitale, la 2e dans la cellule cubitale, la 3e dans la cellule discoïdale antérieure, la 4e dans la cellule discoïdale postérieure, la 5e dans la cellule posticale; 3e rangée formée de 4 taches, dont la 1e sur le bord antérieur, la 2e sur la transversale, 3e entre la médiane et la tige de la posticale, la 4e transversale, sur l'extrémité de l'anale; en outre deux taches plus proximales sur le bord inférieur de la cellule anale et une 3e, vis-à-vis d'elles, entre la médiane et la tige de la posticale; entre la 2e et la 3e rangée, le bord costal est gros et brun noir; transversale blanche, 1e cellule radiale très mince, 2e plus longue et plus de deux fois plus large que la 1e, discoïdale brièvement pétiolée, bifurcation de la posticale sous l'extrémité de la 1e cellule radiale, rameau anterior un peu arqué. Pattes blanchâtres ou jaune pâle, tibia postérieur à longs poils, métatarse postérieur seulement de moitié plus que le 2e article.

Longueur, 1 millimètre.

Formose, Taihoku.

Cette espèce a beaucoup de ressemblance avec *C. polystictus* Kieff. du Paraguay, mais chez cette dernière, les taches de la 1e rangée sont éloignées du bord distal de l'aile de deux fois leur diamètre et les articles antennaires 4–13 sont d'égale longueur.

Culicoides philippinensis sp. nov.

Femelle.—Brun ou brun noir. Tête vue de devant à peine transversale. Yeux glabres, très arqués, larges en haut, où ils sont séparés de la demi-largeur du scape. Bouche à pièces dentelées, égalant les trois quarts de la hauteur de la tête. Palpes brun noir, dépassant à peine la bouche, 2e article le plus long et le plus gros, grossi médialement avant le milieu, 3e et 4e largement fixés l'un à l'autre, un peu plus longs que gros, ensemble aussi longs que le 1er. Antennes brunâtres, articles 10–14 ensemble aussi longs que 2–9 réunis, subcylindriques, graduellement plus longs, à poils épars presque deux fois aussi longs que la grosseur des articles, le 14e sans stylet, presque deux fois aussi longs que le 10e, celui-ci d'un tiers plus long que le 9e; 2e plus de deux fois aussi gros que le 3e, presque transversale, aminci graduellement à sa base, 3e et 4e de moitié plus longs que gros,

5–9 au moins deux fois aussi longs que gros, un peu amincis aux deux bouts, verticilles de 6 poils, ceux-ci guère plus longs qu'un article, les soies sensorielles un peu plus longues, mais pas plus grosses que les poils des verticilles. Balanciers brun noir. Aile enfumée, à nombreuses taches blanches, dont 3 sur le bord antérieur, l'une à peine proximale de la nervure transversale, la 2e sur l'extrémité de la cubitale, la 3e à égale distance de la 2e et de la pointe alaire, la 1e traverse en partie la transversale et atteint la discoïdale, les 2 autres sont aussi transversales mais n'atteignent pas la discoïdale; 4 autres taches plus petites et subcirculaires sont disposées le long du bord postérieur, mais sans le toucher, la 1e entre les deux rameaux de la discoïdale, la 2e dans la cellule discoïdale postérieure, la 3e entre les deux rameaux de la posticale, la 4e dans la cellule anale, près du bout distal; deux autres taches se trouvent encore dans la cellule anale, une circulaire sous le milieu de la tige de la posticale, l'autre allongée, traversant obliquement le tiers basal de la cellule; une tache occupe encore la base de la cellule posticale, une se trouve au-dessus de la bifurcation de la posticale, une au-dessus et une au-dessus du milieu du rameau postérieur de la discoïdale; enfin la cellule médiane est entièrement blanche; surface à soies microscopiques, parsemée de soies plus longues; transversale oblique, égalant la 1e cellule radiale, celle-ci très étroite, allongée, aussi longue et de moitié aussi large que la 2e; cubitale éloignée de la pointe alaire du double de sa longueur; discoïdale brièvement pétiolée, bifurcation de la posticale sous l'extrémité de la 1e cellule radiale, rameau antérieur faiblement arqué. Pattes brunâtres, base des tibias jaune, tarses jaunâtres, métatarse antérieur égalant les 4 articles suivants réunis, 4e un peu plus court que le 5e, empodium atteignant le milieu des crochets, ceux-ci avec des soies à leur base.

Longueur, 1.2 millimètres.

Philippines, Luzon, Laguna, Los Baños.

Genus **DASYHELEA** Kieffer

Dasyhelea formosana sp. nov.

Femelle.—Tête et thorax gris, mats. Antennes brun roux, 2e article un peu plus gros et un peu plus long que le 3e, aminci à sa base; 2–13 subégaux, graduellement à peine un peu plus longs, leur moitié distale graduellement et faiblement amincie, leur base striée jusqu'au verticille, celui-ci formé de 6 ou 7 poils un peu plus longs, mais moins gros que les soies sensorielles, les articles 10–13 ne se distinguent de 2–9 que par la présence de

petits appendices ou poils très courts et cylindriques, épars sur la moitié distale de ces articles; 14e strié à sa base, avec verticille et soies sensorielles comme les précédents, mais dépourvus d'appendices, presque deux fois aussi long que le 13e, graduellement aminci en pointe dans son tiers distal. Mesonotum à petites taches noires; épaules et scutellum jaunes. Balanciers blancs. Aile hyaline, cubitale dépassant le milieu de l'aile, soudée à la radiale et formant avec elle un trait allongé brun noir, 2.5 fois aussi longue que la transversale; bifurcation de la discoïdale sous la transversale, celle de la posticale sous l'extrémité de la cubitale; surface finement pubescente, base peu lobée. Pattes blanchâtres, genoux et le 5e article des tarses noirs, tibia postérieur et tarse postérieur à longs poils dorsaux, métatarse postérieur presque aussi long que les quatre articles suivants réunis, 2e et 3e subégaux, 4e plus court que le 5e. Abdomen noir, déprimé, bord postérieur des tergites blanchâtre, dessous de l'abdomen jaune.

Longueur, 1.5 millimètres.

Formose, Hokuto.

Genus **STILOBEZZIA** Kieffer

Stilobezzia decora Kieff.

On ne connaissait que la ♀ de cette espèce. Le mâle a le thorax d'un blanc jaunâtre en entier, abdomen sombre dans la moitié postérieure, blanchâtre dans la moitié antérieure. Panache d'un jaune d'or, avec l'extrémité brune; antennes jaunâtres, 2e article deux fois aussi long que le 3e, à base longuement pétiolée, les suivants subglobuleux ou subfusiformis, d'abord aussi gros que longs, puis graduellement un peu plus longs et plus minces, le 11e presque deux fois aussi long que gros, 12–14 longuement cylindriques, graduellement plus longs, ensemble presque aussi longs que 2–11 réunis. Pattes colorées et conformées comme chez la ♀, sauf que les crochets sont petits et simples. Ailes comme chez la ♀, mais l'extrémité de la cubitale est moins grossie.

Longueur, 2 millimètres.

Formose, Anping, 1 ♂, 6 ♀ ♀, octobre 1912; une ♀ avait le thorax brun sombre.

Genus **DICROHELEA** Kieffer

Dicrohelea albiclava sp. nov.

Femelle.—Brun noir, mat. Yeux séparés par une fine ligne. Bouche plus courte que la demi-hauteur de la tête, en forme de

bec. Palpes de 4 articles, les deux premiers cylindriques, un peu plus de deux fois aussi longs que gros, les deux derniers beaucoup plus minces, ensemble à peine plus longs que le 2e, le dernier plus long que l'avant-dernier, cylindrique, un peu plus de deux fois aussi long que gros. Scape roux brun, articles 10–14 ensemble de moitié plus longs que 2–9 réunis, subcylindriques, 14e arrondi au bout, chacun 2.5 fois le 9e; 2e presque double du 3e; 3–9 graduellement un peu amincis et allongés, le 3e de moitié plus long que gros, le 9e deux fois. Mesonotum subglabre, pruineux de gris, sans dent en avant. Balanciers blancs. Aile hyaline, faiblement lobée, dépassant l'abdomen, presque linéaire, nervures antérieures jaunes, transversale et base de cubitale brun noir; 1e cellule radiale 2.5 fois aussi longue que large, se terminant au milieu de l'aile, la 2e trois fois plus longue que la 1e, mais encore plus mince, cubitale atteignant le dernier $\frac{1}{6}$ de l'aile, éloignée de la pointe alaire presque de sa demi-longueur; partie distale de la radiale un peu plus courte que la proximale, deux fois aussi longue que la base de la cubitale; bifurcation de la discoïdale proximale de la transversale, celle-ci perpendiculaire et plus courte que la base de la cubitale, les deux rameaux pâles, subparallèles, un peu divergents distalement, l'antérieur aboutissant près de la pointe alaire; bifurcation de la posticale sous le milieu de la 1e cellule radiale, rameau antérieur continuant la direction de la tige; anale bifurquée; pas de fourche intercalée. Les quatre premiers articles tarsaux blanc brunâtre; pattes antérieures les plus courtes, pattes postérieures les plus longues, fémurs antérieurs subcylindriques, avec 6 spinules noires, dans leur moitié distale; fémurs intermédiaires de même forme, avec 3 spinules; fémurs postérieurs graduellement grossis distalement, avec 4 spinules; tibias tous un peu plus minces que les fémurs, beaucoup plus gros que les tarses, avec des spinules alignées sur leur côté dorsal, ces spinules moins grosses que celles de fémurs, mais plus longues; metatarse antérieur égalant les trois articles suivants réunis, métatarse postérieur égalant les quatre articles suivants réunis; 2e article de moitié plus long que le 3e aux quatre tarses antérieurs, deux fois le 3e au tarse postérieur; 3e article de moitié plus long que le 4e aux quatre tarses antérieurs, deux fois le 4e au tarse postérieur; 4e article un peu plus long que gros, obliquement tronqué au bout; 5e article de tous les tarses égalant presque le 3e et le 4e réunis, armé ventralement de trois rangées de six batonnets noirs, ceux-ci environ deux fois aussi longs que la grosseur

de l'article; crochets de toutes les pattes égaux, grands, bifides, les rameaux inégaux, le grand trois fois aussi long que le petit, atteignant les trois quarts de la longueur de l'article. Les deux premiers segments abdominaux un peu plus minces que les suivants.

Longueur, 3.5 millimètres.

Formose, Iushifun, Taihoku District, juin 1914.

Genus **MIXOHELEA** Kieffer

Mixohelea ciliaticrus sp. nov.

Femelle.—D'un jaune d'ambre sale. Tête un peu transversale, vue de devant. Yeux confluents au vertex. Bouche plus courte que le tiers de la hauteur de la tête. Articles 3 et 4 des palpes plus minces que les deux premiers. Antennes brunes, scape, tiers basal des articles 2–9 et extrême base des articles 10–14 jaunes; articles 10–14 ensemble de $\frac{2}{7}$ plus longs que 2–9 réunis, graduellement un peu plus longs, subcylindriques, un peu grossis à la base, à poils épars et longs, comme chez l'espèce précédente, le 10e de trois quarts plus long que le 9e, le 14e de $2\frac{2}{3}$ plus long que le 9e, un peu aminci à l'extrémité; le 3e subcylindrique comme les suivants, deux fois aussi long que gros, d'un tiers plus court que le 2e, dont la base est un peu amincie; 3–9 graduellement un peu plus longs, les derniers amincis en col dans leur tiers distal, le 9e trois et demie aussi long que gros; verticilles composés de 4 ou 5 poils, comme chez l'espèce précédente, soies sensorielles pas plus grosses que les poils des verticilles. Thorax aussi haut que long. Mesonotum glabre, pruineux de gris, mat, parsemé de points noirs, sans dent au bord antérieur. Balanciers blancs. Ailes hyalines, dépassant l'abdomen, sublinéaires, à peine lobées; nervures antérieures jaunes, 1e cellule radiale linéaire, au moins 3 fois aussi longue que large, 2e cellule radiale 3 fois aussi longue que la 1e et un peu plus large qu'elle, partie distale de la radiale un peu plus courte que la proximale, au moins trois fois aussi longue que la base de la cubitale; transversale très courte; cubitale aussi proche de la pointe alaire que le rameau antérieur de la discoïdale, dont la bifurcation est proximale de la transversale; bifurcation de la posticale un peu distale de la transversale, son rameau antérieur continue la direction de la tige; anale bifurquée. Pattes brun roux, tarses blancs, extrémité des articles 1–4 et le 5e en entier noirs; pattes antérieures un peu plus courtes que les 4 autres, tous les tibias un peu plus longs que les fémurs, pattes postérieures pas plus

longues que les intermédiaires sauf le tarse, qui est plus long que les 4 tarses antérieurs; fémurs antérieurs un peu arqués, presque deux fois aussi gros que le tibia, à 6 spinules dans la moitié distale; fémurs intermédiaires et postérieurs à 5 spinules, ces derniers un peu grossis distalement, où ils sont médiocrement velus; tibias postérieurs à longs cils alignés dorsalement; tarses beaucoup plus minces que les tibias, métatarse antérieur de deux tiers plus long que le 2e article, métatarse postérieur plus de deux fois aussi long que le 2e article; celui-ci presque double du 3e au tarse antérieur, plus de deux fois le 3e au tarse postérieur; 3e de moitié ou de deux tiers plus long que le 4e, celui-ci à peine plus long que gros, obliquement tronqué à l'extrémité; 5e article de tous les tarses au moins aussi long que 3 et 4 réunis, avec 3 rangées longitudinales de 5 ou 6 batonnets noirs; crochets inégaux et simples, l'un égalant les trois quarts de l'article, l'autre égalant les deux tiers du grand. Abdomen brun.

Longueur, 3 millimètres.

Formose, Iushifun, Taihoku District, juin 1914.

Genus **PALPOMYIA** Meg. in Meigen

Palpomyia atriclava sp. nov.

Femelle.—Noir brillant, subglabre. Bouche petite, n'ayant pas le tiers de la hauteur de la tête. Articles 3 et 4 des palpes moins gros que le 2e. Yeux séparés par une ligne brillante. Front, face, palpes et bouche jaune sale et brillant. Antennes brunes, scape et 2e article jaunes, articles 2–9 ensemble à peine plus de moitié aussi longs que 10–14 réunis et un peu plus clairs que ceux-ci, le 2e double du 3e, graduellement aminci à la base, les suivants subcylindriques, graduellement un peu plus longs, le 3e deux fois aussi long que gros, le 9e deux fois un tiers; verticilles composés de 4 ou 5 poils; 10–14 subcylindriques, graduellement un peu plus longs, le 10e deux fois et quart le 9e, 14e d'un tiers plus long que le 10e, un peu aminci au bout. Balanciers brun noir, tige blanc sale. Ailes faiblement teintées d'enfumé, à peine lobées, dépassant un peu l'abdomen, nervures brun noir, cubitale atteignant le quart distal de l'aile, aussi loin de la pointe alaire que le rameau postérieur de la discoïdale, 1e cellule radiale linéaire, trois fois aussi longue que large, la 2e deux fois et demie aussi longue que la 1e et d'égale largeur, base de la cubitale oblique et plus longue que la transversale, bifurcation de la discoïdale sous la transversale, comme aussi celle de la posticale, dont le rameau antérieur continue la direction de la tige; anale bifurquée. Pattes blanc jaunâtre, toutes les hanches, fémurs

et tibias des deux pattes postérieures brun sombre, tarses tous blanc sale en entier; pattes antérieures plus courtes que les quatre autres, les deux postérieures un peu plus longues que les intermédiaires; fémur antérieur un peu plus gros que l'intermédiaire, armé de 6 spinules noires, les 4 autres fémurs inermes; tarse intermédiaire un peu plus long que le tibia ou que les quatre articles suivants réunis, 2e article deux fois le 3e, celui-ci de moitié plus long que gros, 4e transversal, cordiforme, la partie prolongée sous le 5e densément poilue, 5e égalant le 3e et le 4e réunis, ayant dans sa moitié distale, à toutes les pattes, trois soies grosses, effilées, arquées et une semblable au tiers proximal; articles 1 et 2 du tarse postérieur à trois rangées de soies bulbeuses sur le dessous; crochets de tous les tarses égalant la moitié de l'article, égaux, avec une minime dent au côté medial.

Longueur, 2.5 millimètres.

Formose, Macuyama, juin 1914.

Genus **PROBEZZIA** Kieffer

1. Abdomen brun noir, pattes brunes, quatre premiers articles tarsaux blancs..... **P. bakeri** sp. nov.
   Abdomen et pattes d'un blanc sale..... **P. myrmedon** sp. nov.

Probezzia bakeri sp. nov.

Femelle.—Noir. Yeux largement confluents en haut. Bouche blanchâtre, égalant la demi-hauteur de la tête. Antennes brun noir, articles 2–9 ensemble aussi longs que les 5 derniers réunis, le 2e de deux tiers plus long que le 3e, qui est de moitié plus long que gros, les suivants graduellement un peu plus longs, le 9e deux fois et demie aussi long que gros, 10e de deux tiers plus long que le 9e, 10–14 égaux. Thorax sans dent au bord antérieur, scutellum et balanciers jaune blanchâtre. Aile blanchâtre, nervures très pâles, cubitale un peu plus de deux fois la radiale, distante de la pointe alaire de sa demi-longueur, aboutissant vis-à-vis de l'extrémité du rameau antérieur de la posticale, bifurcation de la discoïdale proximale de la transversale. Pattes brunes, tarses blancs, 5e article noir; fémurs non grossis, inermes, les deux premiers articles du tarse postérieur à trois rangées ventrales de soies bulbeuses, le premier égalant les quatre suivants réunis, le 2e de deux tiers plus long que le 3e, qui est de moitié plus long que le 4e, celui-ci cylindrique, comme les précédents, trois fois aussi long que gros, 5e un peu plus de deux fois le 4e, armé à tous les tarses de deux ou trois rangées longitudinales, et ventrales de six batonnets noirs presque deux fois aussi longs que la grosseur de l'article; crochets de tous les tarses égaux, bifides, ra-

meaux inégaux, le grand rameau à peine plus court que l'article, quatre fois aussi long que le petit; empodium nul. Abdomen brun noir.

Longueur, 3.5 millimètres.

Philippines, Luzon, Laguna, Los Baños.

Probezzia myrmedon sp. nov.

Mâle.—Noir. Antennes jaunes et courtes, articles 2–10 égalant les quatre derniers, le 2e plus long et beaucoup plus gros que le 3e, 3–10 d'abord subglobuleux, puis à peine plus longs que gros, à panache peu développé, les poils ne dépassant pas le 3e article suivant; 11e article subcylindrique, comme les suivants, d'un tiers plus long que le 10e et aussi gros que lui, 12e d'un tiers plus long que le 11e, de moitié plus court que le 13e, celui-ci assez fortement aminci distalement, à peine aussi long que le 14e, qui est arrondi à l'extrémité et subcylindrique. Balanciers d'un blanc sale. Aile hyaline, cubitale à peine deux fois la radiale, éloignée de la pointe alaire autant que le rameau antérieur de la posticale, bifurcation de la discoïdale proximale de la transversale, celle de la posticale un peu distale de la transversale, base alaire peu lobée. Pattes d'un blanc sale, fémurs inermes, non grossis, 4e article court, tronqué obliquement, le 5e long, inerme, crochets petits, simples, égaux. Abdomen blanc sale.

Longueur, 1 millimètre.

Formose, Anping, octobre 1912.

Genus BEZZIA Kieffer

1. Yeux confluents; pattes brun sombre, tarses et anneau distal des 4 fémurs antérieurs blanc jaunâtre..... **B. insularis** sp. nov.
   Yeux séparés par une fine ligne; pattes jaunes, anneau distal des 4 fémurs postérieurs, extrémité des 2 tibias postérieurs et 5e article tarsal brun noir..... **B. nigriclava** sp. nov.

Bezzia insularis sp. nov.

Femelle.—Noir, mat. Yeux confluents. Front avec une verrue au-dessus des antennes. Bouche plus courte que le quart de la hauteur de la tête. Les deux derniers articles des palpes à peine plus minces que le 2e. Antennes brunes, scape jaune, articles 2–9 ensemble un peu plus courts que 10–14 réunis, un peu allongés, 10–14 plus sombres. Thorax très convexe, plus haut que long, bien plus haut que le vertex, brun noir, ayant en avant deux petites taches blanches et obliques, et deux autres plus petites, plus en arrière et plus en dehors. Balanciers noirs. Aile subhyaline, très faiblement teintée d'enfumé, atteignant l'extré-

mité de l'abdomen, lobe arrondi, nervures antérieures brunes, cubitale un peu plus de deux fois la radiale, un peu plus loin de la pointe alaire que le rameau posterieur de la discoïdale, dépassant faiblement le second tiers de l'aile, bifurcation de la discoïdale proximale de la transversale, celle de la posticale un peu distale de la transversale, celle-ci proximale du milieu de l'aile, anale bifurquée; sans fourche intercalée. Pattes brun sombre, brillantes, un anneau avant l'extrémité des 4 fémurs antérieurs et tous les tarses blanc jaunâtre, pattes postérieures les plus longues, antérieures les plus courtes, fémurs non grossis, les antérieurs armés de quatre spinules, les quatre autres inermes, tarse postérieur de moitié plus long que le tibia, celui-ci aussi long que le fémur, métatarse un peu plus long que les trois articles suivants réunis, 3e deux à trois fois aussi long que gros, 4e cordiforme, transversal vu d'en haut, 5e long, inerme à tous les tarses; crochets petits, plus courts que la moitié de l'article, à dent médiale à peine perceptible.

Longueur, 1.5 millimètres.

Formose, Anping, octubre 1912.

Bezzia nigriclava sp. nov.

Femelle.—Tête jaune brunâtre, occiput cendré. Front avec une verrue au-dessus des antennes. Yeux à peine séparés par une fine ligne. Antennes brunes, scape jaune, base des articles 2–9 jaunâtre, 10–14 ensemble un peu plus longs que 2–9 réunis, 10–13 égaux, cylindriques, chacun deux fois aussi long que le 9e, 14e de moitié plus long que le 10e, 2e au moins deux fois le 3e et à peine plus gros, sa base amincie en pétiole, 3–9 graduellement à peine plus longs, presque ellipsoïdaux, le 9e presque deux fois aussi long que gros, verticilles composés de 4 ou 5 poils. Thorax mat, brun, avec trace de 3 bandes raccourcies brunes, confluentes et bordées d'une fine ligne cendrée; en avant se voit de chaque côté de la bande médiane une tache blanche. Balanciers brun noir, tige plus claire. Aile hyaline, lobée, dépassant l'abdomen, lobe arrondi, nervures antérieures brunes, extrémité de la cubitale noire, celle-ci double de la radiale, atteignant le quart distal, aussi distante de la pointe alaire que le rameau postérieur de la discoïdale, bifurcation de la discoïdale sous la transversale, celle de la posticale à peine distale, son rameau antérieur continuant la direction de la tige; anale bifurquée. Pattes jaunes, hanches brunes, faible anneau avant l'extrémité des 4 fémurs postérieurs, extrémité des 2 tibias postérieurs et 5e article tarsal brun noir; fémurs non grossis, pattes antérieures

les plus courtes, leur femur aussi long que le tibia, armé de 2 spinules, les 4 autres fémurs inermes, tibia postérieur égalant le tarse, métatarse postérieur aussi long que les quatre articles suivants réunis, à 3 rangées de soies ventrales bulbeuses, comme le 2e article, celui-ci à peine plus court que les trois suivants réunis, 3e de moitié plus long que gros, 4e cordiforme, transversal vu d'en haut, 5e aussi long que le 3e et le 4e réunis, inerme à toutes les pattes; crochets égaux, égalant la moitié de l'article, à dent médiale à peine perceptible. Abdomen brun noir.

Longueur, 2 millimètres.

Formose, Macuyama, 2 ♀ ♀ juin 1914.

TANYPINÆ

Procladius philippinensis sp. nov.

Mâle.—Blanchâtre. Yeux à tiers supérieur trés aminci, linéaire, 2.5 fois aussi long que large, ils sont séparés de quatre fois leur largeur terminale. Vertex brun. Palpes longs, 1er article deux fois aussi long que gros, 2e le moitié plus long que le 1er, un peu plus court que le 3e, 4e égalant presque 2 et 3 réunis. Antennes brunes, de 15 articles, scape et 15e article noirs, panache gris, articles 3–13 transversaux, 14e à peine plus long que 2–13 réunis. Metanotum, trois bandes confluentes du mesonotum, dont les latérales sont raccourcies en avant et mesosternum brun noir. Balanciers blancs. Aile hyaline, finement pointillée, glabre, lobée, peu large, nervure sous-médiane à poils espacés, transversale antérieure noire et bordée de noir, comme les parties adjacentes de la cubitale et de la discoïdale, ce qui forme une tache en arc noire, l'endroit où la transversale postérieur touche la posticale forme un point noir, les deux transversales se touchent, l'antérieure oblique, la postérieure perpendiculaire, radiale à deux rameaux bien marqués, cubitale dépassée par la costale de la longueur de la transversale antérieure, pas plus distante de la pointe alaire que la discoïdale, tige de la fourche de la posticale aussi longue que le rameau inférieur, celui-ci non subitement incurvé. Pattes blanchâtres, un faible anneau brunâtre avant l'extrémité des fémurs, extrémité des tibias et des métatarses et les quatre articles suivants noirs; tibia antérieur plus long que le fémur, de deux tiers plus long que le métatarse, à éperon au moins aussi long que sa grosseur et pectiné dans sa moitié basale, les 6 ou 7 branches filiformes, pointues et un peu sinueuses, articles 1–4 graduellement raccourcis, 5e égal au 4e et cylindrique comme lui; au tarse postérieur, le 4e un peu plus court que le 5e; crochets grands et noirs, empodium court, pulvilles nuls. Abdomen et

pince brun noir, bord postérieur des quatre premiers segments formant une étroite ceinture blanche. Articles terminaux de la pince gros, presque triangulaires, pubescents, terminés par un long stylet noir.

Longeur, 2.8–3 millimètres.

Femelle.—Brun sombre, mat; mesonotum avec trois bandes raccourcies et se touchant, d'un brun noir, espace situé en avant de chacune des bandes latérales du mesonotum, haut des mésopleures et le pronotum blanc sale; scutellum jaune, balanciers et pattes comme chez le ♂. Tête blanc sale. Yeux séparés de trois fois leur terminale, partie amincie pas plus longue que large, subcarrée. Antennes brunes, de 14 articles, dont le 2e obconique et deux fois aussi long que le 3e, 3–13 serrés, un peu transversaux ou à peine aussi longs que gros, á verticilles de poils courts, pas deux fois aussi longs que la grosseur des articles, 14e grossi, aussi long que les trois précédents réunis, avec verticille et court stylet avec soie. L'aile blanche a, outre l'arc noir du ♂, quelques taches grises, irrisées et peu distinctes, dont la plus grande est transversale, large, et s'étend de l'extrémité de la radiale jusqu'au milieu du rameau antérieur de la posticale; l'autre, moins grande, depuis le milieu de la nervure anale jusqu'au bord postérieur, large et un peu transversale; la 3e, plus petite encore, sur le milieu du rameau postérieur de la posticale.

Longueur, 1.5 millimètres.

Philippines, Luzon, Laguna, Los Baños, 3 ♂ ♂, 4 ♀ ♀.

Tanypus monilis Linn.

Philippines, Luzon, Laguna, Los Baños, 1 ♀; Formose, Anping, octobre 1912, et Daitotei.

Protenthes punctipennis Meig.

Les taches de l'aile sont plus grandes que chez le type d'Europe, plus ou moins confluentes, la couleur enfumée occupant autant d' espace que la couleur blanche. Antennes de la ♀ de 15 articles, dont le 2e et le 3e sont peu distinctement séparés.

Formose, Taihoku et Daitotei, 1 ♂, 6 ♀ ♀.

Trichotanypus insularis sp. nov.

Femelle et mâle.—Tête et thorax du ♂ roux brun, mesonotum avec trois bandes raccourcies, peu marquées, plus sombres, pruineuses en avant, metanotum et mesosternum brun noir, scutellum jaune, balanciers blanc pur. Tête et thorax de la ♀ brun sombre, trois bandes plus sombres, luisantes, raccourcies, sur le

mesonotum, scutellum jaune brunâtre, balanciers blanc pur. Yeux du ♂ séparés de deux fois leur largeur terminale, partie amincie linéaire, deux fois aussi longue que large. Antenne du ♂ jaune sale, panache brun noir. Antenne de la ♀ jaunâtre. Aile enfumée, moins sombre et plus étroite chez le ♂ que chez la ♀, irrisée sur les parties sombres, avec 3 taches blanches formant une bande transversale arquée qui occupe l'extrémité de l'aile, à savoir le quart distal de la cellule cubitale, l'extrémité de la cellule discoïdale et de la cellule posticale; 2 autres taches blanches formant une bande transversale, l'une est transversale et va du bord antérieur, un peu distalement des nervures transversales, jusqu'à la posticale; l'autre, dans la cellule anale, sous la bifurcation de la posticale, subarrondié, eloignée du bord postérieur; base alaire blanchâtre; poils noirâtres sur les parties sombres, blancs sur les taches blanches; les deux nervures transversales noires et bordées de noir, se touchant, l'antérieure oblique, l'inférieure perpendiculaire; radiale bifurquée, costale dépassant longuement la cubitale et atteignant presque la pointe alaire, dont elle est plus rapprochée que la discoïdale, celle-ci arquée; posticale longuement pétiolée, sa tige presque aussi longue que le rameau postérieur, celui-ci non incurvé au bout; lobe alaire ressortant semicirculairement. Pattes jaune sale (♂) ou brun noir (♀); extrémité des tibias du ♂, des trois premiers articles tarsaux et les deux derniers en entier brun noir; tarses de la ♀ blanc, extrémité des deux premiers articles et les deux derniers en entier brun noir; tarse antérieur non barbu, métatarse double du 2e article, un peu plus court que le tibia, 2–5 graduellement raccourcis et cylindriques. Abdomen brun noir, droit et déprimé (♂) ou arqué et fortement comprimé (♀). Pince brun noir; articles terminaux pubescents, petits, bilobés, le lobe proximal, qui continue la direction du lobe distal, est obtus et à peine plus court que long, lobe distal plus mince et 2 à 3 fois plus long, presque droit, graduellement aminci, son extrémité formant une petite pointe noire; chez toutes les espèces connues le lobe proximal est long et le lobe distal court, mais il se peut que, sur l'exemplaire examiné ici, les deux articles terminaux de la pince aient été retournés par accident.

Longueur, ♂, 2.5 millimètres; ♀, 1.8 millimètres.

Formose, Daitotei.

Var. transiens var. nov.

Femelle.—Couleur du corps et des pattes comme chez le ♂ du type; la bande blanche distale manque chez une ♀, ou n'est

représentée que par una trace chez l'autre ♀ ; mesonotum brillant, sans bande distincte. Antenne de 13 articles, et non de 14 comme chez *T. iris* Kieff.; 2e article obconique, plus de deux fois aussi long que le 3e, 3–12 un peu transversaux, verticilles à 6–8 poils courts, pas deux fois aussi longs que la largeur des articles; 13e article brun, grossi, un peu plus long que les trois précédents réunis, muni d'un verticille basal et d'un court stylet terminal, celui-ci avec une soie médiocre.

Longueur, 1.8 millimètres.

Avec le type.

Clinotanypus formosæ Kieff.

Femelle.—Posticale brièvement pétiolée, la tige plus courte que la moitié du rameau postérieur, celui-ci non incurvé distalement. Empodium court, n'atteignant pas le milieu des crochets, ceux-ci peu arqués; grand éperon du tibia postérieur égalant la grosseur du tibia, graduellement aminci en pointe et dentelé.

Formose, Anping; était signalé déjà pour Takao.

CHIRONOMINÆ

ORTHOCLADIARIÆ

Trichocladius nitens sp. nov.

Femelle et mâle.—Roux ou roux brun, brillant. Yeux pubescents. Antennes du mâle brunes, comme le panache, 14e article à peine plus long que 2–13 réunis, 3–13 à peine transversaux. Antennes de la femelle brun jaunâtre, 2e article non rétréci au milieu, plus gros et deux fois aussi long que le 3e, 3–5 un peu amincis aux deux bouts, deux fois aussi longs que gros, 5e un peu plus long que le 4e, 6e subcylindrique, presque trois fois le 5e. Thorax dépassant la tête en avant, metanotum noir, mesonotum du mâle avec trois bandes raccourcies d'un brun noir, celui de la femelle sans bande. Balanciers blancs. Aile très faiblement assombrie, glabre, peu lobée, nervures brunes, cubitale médiocrement dépassée par la costale, chez le mâle double de la radiale et aussi proche de la pointe alaire que la discoïdale, chez la femelle 2.5 fois aussi longue que la radiale et moins proche de la pointe alaire que la discoïdale, 2e longitudinale aboutissant à égale distance de la radiale et de la cubitale, pas de nervure intercalée entre la cubitale et la discoïdale, bifurcation de la posticale sous la transversale ou à peine distale. Pattes du mâle blanchâtres, quart distal des fémurs brun, tibia antérieur blanc pur, à tiers distal noir, tarse antérieur brun sombre, 5e article des quatre autres tarses un peu assombri; chez la

femelle les pattes antérieures sont jaune brunâtre, les quatre autres blanc sale, extrémité des fémurs brune, tibia antérieur blanc pur, à tiers distal noir, tarse antérieur brun noir, extrémité des quatre tibias postérieurs brun noir, tarse, surtout les derniers articles, assombris; tibia antérieur d'un tiers plus long que le métatarse chez le mâle, de moitié plus long chez la femelle, métatarse double du 2e article, 2–4 graduellement raccourcis, 4e de moitié plus long que le 5e, empodium filiforme, aussi long que les crochets, pulvilles nuls. Abdomen jaune clair; chez le mâle, une tache latérale transversale au bord antérieur du 2e segment, le 3e segment presque en entier, une étroite bande transversale sur le devant du 4e et 5–7 presque entièrement brun noir, segment anal noir profond, pince blanche; chez la femelle, les tergites 2 et 3, 5 et 6 et le segment anal brun noir.

Longeur, ♂, 2.5 millimètres; ♀, 1.5 millimètres.

Formose, Daitotei, 1 ♂; Taihoku, 1 ♀.

Cricotopus carnosus Kieff. var.

Femelle.—Jaune citrin. Antennes brunes. Thorax ne dépassant pas le thorax en avant. Mesonotum brillant, trois bandes raccourcies, metanotum et mesosternum noirs. Balanciers blancs. Aile comme chez le type. Pattes blanc sale, extrémité des fémurs brune, tibia antérieur à large anneau blanc, les deux extrémités noires, les quatre autres tibias ont seulement les extrêmes bouts noirs; tarse antérieur, extrémité des articles 1–3 et les deux derniers en entier aux autres tarses, brun noir; empodium égalant les crochets, pulvilles larges, atteignant le milieu des crochets. Tergites 2 et 3, une mince bande transversale du 4e, une autre plus large sur le 5e et sur le 6e, noirs.

Longueur, 1 millimètre.

Formose, Daitotei.

CHIRONOMARIÆ

Genus **POLYPEDILUM** Kieffer

1. Aile hyaline ou subhyaline, sans tache ..... 2.
   Aile brune, fortement irrisée, avec sept taches blanches.
   P. iricolor Kieff.
   Aile blanchâtre à taches brunes ..... 3.
2. Article 5e de l'antenne de la ♀ à col transversal ..... **P. nanulus** Kieff.
   Article 5e de l'antenne de la ♀ sans col, pas distinctement séparé du 6e ..... **P. macrotrichum** sp. nov.
3. Transversale noire, les autres nervures claires ..... **P. atrinerve** sp. nov.
   Transversale pas plus sombre que les autres nervures ..... 4.
4. Aile à tache unique, située dans la base de la cellule cubitale.
   P. monostictum Kieff.
   Aile à taches nombreuses ..... 5.

5. Article 5e des antennes de la ♀ en forme de bouteille, avec un col allongé; trois taches brunes entre la cubitale et la discoïdale.
P. pelostolum Kieff.
Article 5e des antennes de la ♀ sans col, ellipsoïdal, seulement deux taches dans la cellule cubitale..... 6.
6. Pas de tache dans la cellule discoïdale..... P. sauteri sp. nov.
Deux taches dans la cellule discoïdale..... P. consobrinum Kieff.

Polypedilum macrotrichum sp. nov.

Femelle.—Brun noir. Antenne jaune brunâtre, 2e article à peine rétréci au milieu, deux fois et demie aussi long que gros, à col aussi long que gros, 3e et 4e globuleux ou en ovoïde court, à col plus de deux fois aussi long que gros, 5e en ovoïde court, pas distinctement séparé du 6e, son verticille dépassant l'article terminal, composé de 6 ou 7 poils d'inégale longueur, comme c'est aussi le cas pour le verticille du 3e et du 4e; 6e article mince, brun noir, deux fois un tiers aussi long que le 5e, ayant à l'extrémité quatre poils aussi longs que lui. Balanciers brun noir, tige blanc brunâtre. Aile subhyaline, très faiblement assombrie, sa moitié proximale jusqu'à la bifurcation de la posticale et l'origine de la cubitale plus sombre, transversale située au milieu ou peu avant le milieu de l'aile, cubitale aboutissant â la pointe alaire ou à peine avant, discoïdale bien plus éloignée de la pointe alaire, bifurcation de la posticale à peine distale; les nervures de la moitié proximale un peu plus sombres que celles de la moitié distale. Pattes sauf les hanches, d'un jaune pâle, deux derniers articles tarsaux assombris, métatarse antérieur au moins double du tibia, 2e article un peu plus court que le tibia, de moitié plus long que le 3e, 4e au moins aussi long que le 3e, deux fois le 5e.

Longueur, 2 millimètres.

Formose, Taihoku, 7 novembre 1912.

Polypedilum atrinerve sp. nov.

Femelle.—Roux brun. Palpes longs. Antennes d'un jaune sale, 6e article brun, de deux tiers plus long que lui, 3–5 en ovoïde court, à col deux fois ou plus de deux fois aussi long que gros, verticille de 8 poils, dont deux de moitié plus courts que les autres, ceux du 5e dépassent l'article terminal. Mesonotum gris roussâtre, à trois bandes raccourcies rousses. Balanciers blancs, extrémité de la massue assombrie. Aile blanchâtre, avec trois taches grises et allongées, visibles seulement sous un certain jour, la 1e au milieu de la cellule cubitale, la 2e à l'extrémité de cette cellule, la 3e dans la cellule discoïdale, à égale distance

de la 1e et de la 2e; en outre, les deux rameaux de la posticale et l'anale sont légèrement bordés d'enfumé; radiale dépassant le milieu de la cubitale, mais n'en atteignant pas les deux tiers, cubitale aboutissant aussi près de la pointe alaïre que la discoïdale, bifurcation de la posticale sous la transversale, celle-ci au milieu de l'aile ou un peu proximale du milieu, d'un noir profond, base alaire lobée à angle droit. Pattes d'un jaune pâle, extrémité des quatre premiers articles tarsaux et le 5e en entier assombris, tarse antérieur brisé; peignes, éperons, pulvilles comme d'ordinaire. Abdomen long, brun noir, à longs poils gris, bord postérieur des tergites blanchâtre; cerci jaunâtres.

Longueur, 2.5 millimètres.

Formose, Taihoku, 7 novembre 1912.

Polypedilum sauteri sp. nov.

Femelle.—Brun noir. Antennes jaune brunâtre 2e article presque deux fois aussi long que le 3e, fortement rétréci au milieu, avec un col presque aussi long que large; 3e et 4e en forme de bouteille, renflement ellipsoïdal, col de moitié ou deux fois aussi long que gros; 5e subfusiforme, sans col; verticilles á 5 ou 6 poils, ceux du 5e article n'atteignent pas l'extrémité du 6e, celui-ci mince, deux fois et tiers aussi long que le 5e, avec un poil distal égalant sa demi-longueur. Mesonotum roussâtre en avant sur chaque côté. Balanciers brun noir, tige blanc brunâtre. Aile hyaline ou à peine blanchâtre, avec trois taches grises peu distinctes, dont l'une remplit la base de la cellule cubitale, l'autre allongée, située vers le milieu de cette cellule, la 3e très petite, sur l'extrémité du rameau postérieur de la posticale, encore un point sous l'extrémité de la cubitale et sous celle de la discoïdale et un trait oblique dans la moitié proximale de la cellule anale; base alaire lobée; radiale, cubitale et transversale brunâtres, celle-ci située au milieu ou proximale du milieu, cubitale un peu plus distale de la pointe alaire que la discoïdale, bifurcation de la posticale distale du double de la transversale. Pattes jaune pâle, sauf les hanches, les quatre tibias postérieurs à poils dorsaux un peu plus longs que leur grosseur, les quatre derniers articles du tarse antérieur et les trois derniers des quatre autres tarses assombris, métatarse antérieur au moins deux fois aussi long que le tibia, 2e article égalant à peine le tibia, 2–4 graduellement raccourcis, le 4e de deux tiers plus long que le 5e.

Longueur, 2 millimètres.

Formose, Taihoku, 7 novembre 1912; Daitotei, juin 1914.

Polypedilum pelostolum Kieff.

Femelle et mâle.—Tibia antérieur à écaille obtuse, plus longue que large; éperon des tibias postérieurs unique et long. Les articles antennaires 2–5 du ♂ out de chaque côté une soie sensorielle arquée, hyaline, aussi longue que la grosseur des articles.

Formose, Anping, octobre 1912; Daitotei, juin 1914.

Polypedilum consobrinum Kieff.

Femelle.—Article 6e des antennes à trois longs poils distaux, plus longs que l'article, articles 3–5 glabres, verticilles de 7 poils très longs, ceux du 5e article dépassent de beaucoup le 6e. Pattes blanches, trois premiers articles tarsaux avec un large anneau distal brun; métatarse antérieur de deux tiers plus long que le tibia, 2e article égalant le tibia, de moitié plus long que le 3e, 4e un peu plus court que le 3e, de deux tiers plus long que le 5e. Balanciers brun noir.

Longueur, 2.5 millimètres.

Formose, Anping, octobre 1912; Taihoku, 7 novembre 1912.

Genus MICROTENDIPES Kieffer

1. Aile tachetée..... M. stictopterus sp. nov.
   Aile non tachetée..... M. dimidiatus sp. nov.

Microtendipes stictopterus sp. nov.

Femelle.—Tête jaune brunâtre, transversale vue de devant. Yeux séparés par leur largeur terminale, partie amincie á peine plus longue que large, faisant un angle droit avec la partie élargie. Palpes blanchâtres, longs, 1er article un peu plus long que gros, 2e plus de deux fois le 1er, plus court que le 3e, 4e égalant presque le 2e et le 3e réunis. Antennes jaunâtres, 2e article rétréci au milieu, un peu plus long que le 3e, à col aussi long que gros, 3e et 4e à col égalant le nœud, qui est subellipsoïdal, verticille à 7 poils, ceux du 3e dépassent le 4e article, les articles suivants brisés. Thorax roussâtre. Balanciers noirâtres, à tige blanchâtre. Aile blanchâtre, à taches grises, dont 3 dans la cellule cubitale, la proximale la plus grande, distante de sa demi-longueur de la base de cette cellule, la 2e au milieu, la 3e à l'extrémité; 3 dans la cellule discoïdale, la 1e un peu proximale de la nervure transversale, la 2e en forme de bande longitudinale, la 3e à l'extrémité; 2 dans la cellule posticale, la 1e remplissant la moitié proximale de cette cellule, sans toucher la base, la 2e petite, située sous l'extrémité du rameau antérieur; une tache médiocre entre le milieu de la tige de la posticale et le bord

postérieur de l'aile, un point à l'extrémité de la nervure anale et une petite tache à l'extrémité de la cellule anale, contre le rameau postérieur; base lobée; nervures blanchâtres, cubitale un peu arquée au bout, d'un tiers plus longue que la radiale, aboutissant plus près de la pointe alaire que la discoïdale; bifurcation de la posticale distale de une fois et demie la longueur de la transversale. Pattes blanches, hanches et fémurs, sauf le quart distal bruns, le quart (tarse antérieur), le tiers (au tarse intermédiaire) ou la moitié basale (au tarse postérieur) des articles 1–4 noirs, 5e article brunâtre; fémur anterieur presque deux fois aussi long que le tibia, celui-ci à écaille allongée, terminée subitement par une pointe plus courte que la partie élargie; peigne des 4 tibias postérieurs occupant les trois quarts du contour, l'unique éperon long et arqué; empodium à peine plus court que les crochets, les deux pulvilles larges, un peu plus courts que l'empodium, ayant au côté médian six branches filiformes et longuement poilues; tarse antérieur très grêle, blanc, extrémité des articles noire, métatarse au moins deux fois le tibia. Abdomen brun noir, droit, d'un tiers plus long que le reste du corps; cerci blancs.

Longueur, 2.6–3.8 millimètres.

Philippines, Luzon, Laguna, Los Baños, nombreux exemplaires.

Microtendipes dimidiatus sp. nov.

Femelle.—Jaune roussâtre. Antennes jaunâtres, 2e article de moitié plus long que le 3e, légèrement rétréci au milieu, peu aminci à l'extrémité, 3e et 4e avec un col pubescent et presque aussi long que le renflement, celui-ci en ellipse, 5e sans col, en ellipsoïde allongé, les 6 ou 7 poils des verticilles d'inégale longueur, ceux du 5e, dépassent le 6e article, celui-ci un peu plus de deux fois aussi long que le 5e, mince, à trois poils distaux presque aussi longs que lui. Mesonotum avec trois bandes raccourcies et plus ou moins confluentes rousses. Scutellum blanc jaunâtre. Balanciers brun noir. Aile sans tache, atteignant ou dépassant un peu l'extrémité de l'abdomen, à peine lobée, moitié proximale blanchâtre jusqu'à l'origine de la cubitale et la bifurcation de la posticale, moitié distale très faiblement assombrie et un peu brun rosé, ce qui n'est visible que sous un certain jour; cubitale arquée au bout, aboutissant presque à la pointe alaire, dont elle est bien plus proche que la discoïdale, bifurcation de la posticale distale, rameau antérieur continuant la direction de la tige, transversale très petite, toutes les nervures jaunes. Pattes jaunâtres, tarse antérieur brisé, fémur anté-

rieur avec un large anneau brun avant le milieu, un peu plus long que le tibia, celui-ci avec une écaille obtuse et allongée, l'unique éperon des 4 tibias postérieurs long et un peu arqué, empodium atteignant presque l'extrémité des crochets, les deux pulvilles larges, à longs poils. Abdomen brun, de moitié plus long que le reste du corps, un peu aminci en avant.

Longueur, 2.5 millimétres.

Formose, Taihoku, 7 novembre 1912.

Genus CRYPTOCHIRONOMUS Kieffer

1. Articles antennaires 3–5 de la ♀ avec un petit col..... **C. petiolatus sp. nov.**
   Articles antennaires de la ♀ sans col..... 2
2. Aile non lobée mais graduellement amincie à la base.. **C. subroseus sp. nov.**
   Aile lobée ..... 3.
3. Noir et brillant; pattes noires en majeure partie.... **C. pelochloris Kieff.**
   Thorax jaune, à 3 bandes plus sombres; pattes blanchâtres en majeure partie, abdomen vert..... 2.
4. Articles antennaires 3–5 de la ♀ presque globuleux, un peu plus longs que gros, à verticille court, celui du 5e n'atteignant que le milieu du 6e article, celui-ci 3.5 fois aussi long que le 5e.... **C. sauteri sp. nov.**
   Articles antennaires 3–5 de la ♀ subfusiformes, presque deux fois aussi longs que gros, à verticille long, celui du 5e dépasse le 6e article, celui-ci 2 fois le 5e..... **C. olivaceus sp. nov.**

Cryptochironomus (?) petiolatus sp. nov.

Femelle.—Tête pâle. Palpes longs. Yeux rapprochés. Antennes blanchâtres, 2e article rétréci au milieu, à col transversal, 3–5 à col à peine plus long que gros, poils des verticilles longs, ceux du 5e article dépassent le 6e, celui-ci deux fois aussi long que le 5e, à deux poils distaux égalant sa demi-longueur. Thorax fauve. Mesonotum vert, mat, avec trois bandes raccourcies fauves. Balanciers vert sombre. Aile hyaline, dépassant l'abdomen, nervures brunâtres, cubitale arquée au bout, atteignant presque la pointe alaire, dont elle est plus proche que la discoïdale, dépassant la radiale de plus du tiers, transversale proximale du milieu de l'aile, bifurcation de la posticale assez distale de la transversale. Pattes blanchâtres, tibia antérieur et tous les tarses assombris, métatarse antérieur deux fois aussi long que le tibia, 2e article plus court que le tibia, 2–5 graduellement raccourcis; peignes des quatre tibias postérieurs occupant les $\frac{4}{5}$ du pourtour, les deux éperons courts; empodium un peu plus court que les crochets, à poils ventraux bifurqués; pulvilles un peu plus courts que l'empodium. Abdomen vert sombre, courbé, guére plus long que le reste du corps.

Longueur, 1.8 millimètres.

Formose, Taihoku.

Cryptochironomus (?) subroseus sp. nov.

Femelle.—Blanc rosé. Yeux très arqués, distants d'au moins leur demi-longueur. Antennes blanchâtres, 6e article brun, deux fois aussi long que le 5e, 3–5 sans col, ellipsoïdaux. Mesonotum blanchâtre, brillant, à trois bandes raccourcies jaunes et peu distinctes. Balanciers blancs. Aile blanche, dépassant l'abdomen, non lobée, mais graduellement amincie à la base, glabre, finement pointillée, radiale, sous-costale et cubitale à longs poils espacés; cubitale arquée, au moins deux fois aussi longue que la radiale, aboutissant presque à la pointe alaire; transversale petite, oblique, comme chez *Chironomus*, bifurcation de la posticale assez distale. Pattes blanc sale, tibia et tarse des pattes antérieures assombris, métatarse deux fois aussi long que le tibia, 2e article un peu plus court que le tibia, 2–5 graduellement raccourcis; éperons, pulvilles et empodium? Abdomen de moitié plus long que le reste du corps, faiblement arqué et comprimé.

Longueur, 1.2 millimètres.

Formose, Taihoku.

Cryptochironomus sauteri sp. nov.

Femelle.—Tête et thorax jaunes ou verdâtres. Yeux très arqués, séparés de deux fois leur largeur terminale, partie amincie deux fois aussi longue que large, faisant un angle droit avec la partie élargie. Front sans lobes. Article 1er des palpes un peu plus long que gros, 2e et 3e presque trois fois aussi longs que gros, 4e de beaucoup le plus long. Antennes blanc sale ou brunâtres, 2e article à peine deux fois aussi long que le 3e, subcylindrique, pas distinctement rétréci au milieu, 3–5 subglobuleux, d'un cinquième plus longs que gros, verticilles à 5 ou 6 poils inégaux et peu longs, ceux du 5e article n'atteignent que le milieu du 6e, celui-ci mince, un peu plus de trois fois le 5e, avec un poil distal égalant sa demi-longueur. Mesonotum avec trois bandes raccourcies d'un brun noir ou brunes ou jaune roussâtre. Balanciers verdâtres, extrémité de la massue assombrie. Aile hyaline, pointillée, lobe à angle droit, nervures pâles, cubitale presque double de la radiale, un peu plus éloignée de la pointe alaire que la discoïdale, 2e longitudinale aboutissant très près de la radiale, bifurcation de la posticale à peine distale. Pattes blanchâtres, quatre derniers articles du tarse antérieur un peu assombris, métatarse antérieur de deux tiers plus long que le tibia, double du 2e article, 2–4 graduellement à peine raccourcis, 4e de deux tiers plus long que le 5e, empodium un peu plus court que les

crochets, pulvilles larges, égalant l'empodium, à longs poils; peignes atteignant les trois quarts du pourtour, les deux éperons trés courts. Abdomen vert sombre.

Longueur, 1.8 millimètres.

Formose, Anping, octobre 1912, 35 ♀ ♀.

Cryptochironomus olivaceus sp. nov.

Femelle.—Jaune. Palpes assez longs. Antennes blanchâtres, 6e article brun, deux fois aussi long que le 5e, à deux poils distaux égalant sa demi-longueur, 2e article fortement rétréci au milieu, 3–5 subfusiformes ou subellipsoïdaux, environ deux fois aussi longs que gros, verticilles à poils longs, ceux du 5e article dépassent le 6e. Mesonotum verdâtre, luisant, trois bandes raccourcies, metanotum et mesosternum d'un jaune plus foncé que le reste du thorax. Balanciers vert brun. Thorax aussi long que haut, dépassant la petite tête. Aile hyaline, pointillée finement, à lobe presque à angle droit, nervures pâles, transversale un peu proximale du milieu de l'aile, cubitale aboutissant à la pointe alaire, bifurcation de la posticale notablement distale. Pattes blanchâtres, tibia et tarse antérieurs, et les 2 ou 3 derniers articles des quatre tarses postérieurs un peu assombris, métatarse antérieur presque deux fois le tibia, plus de deux fois le 2e, 2–4 graduellement raccourcis, le 3e de moitié plus long que le 4e, qui est de deux tiers plus long que le 5e, empodium et pulvilles atteignant le milieu des crochets, les pulvilles larges, à longs poils, probablement rameux médialement; peignes atteignant les $\frac{4}{5}$ du pourtour, les deux éperons courts. Abdomen vert brun, arqué, guère plus long que le reste du corps.

Longueur, 2 millimètres.

Formose, Taihoku, 7 septembre 1912.

Cryptochironomus pelochloris Kieff. (sub *Chironomus*).

Femelle.—Aile subhyaline, très faiblement assombrie, moitié proximale de la cellule cubitale et presque la moitié proximale de la cellule posticale, comme aussi l'extrémité alaire depuis l'embouchure de la cubitale et de celle du rameau antérieur de la posticale, un peu plus assombries mais peu visiblement, ces parties fortement irrisées. Tibia postérieur à deux éperons courts, métatarse postérieur à crochets ventraux dans sa moitié distale, pulvilles égalant l'empodium, plus court que les crochets, à longs poils. Abdomen arqué.

Longueur, 2.2 millimètres.

Formose, Taihoku, 7 septembre 1912.

Genus LIMNOCHIRONOMUS Kieffer

Limnochironomus niveicauda sp. nov.

Femelle et mâle.—Brun noir. Tête transversale vue de devant. Yeux glabres, trés arqués, peu amincis en haut, où ils sont séparés de leur largeur terminale. Palpes bruns, 1er article guère plus long que gros, 2e plus de deux fois le 1er, dépassant un peu la bouche, 3e plus long que le 2e, 4e égalant le 2e et le 3e réunis. Antennes du ♂ brun noir, comme leur panache, 2e article jaune sale, presque deux fois le 3e, 3–11 un peu transversaux, à deux rangées transversales de poils du panache, 12e un peu plus de deux fois aussi long que 2–11 réunis, pointu au bout. Antennes de la ♀ jaunes, scapes brun noir, séparés de deux fois leur diamètre, 2e article fortement rétréci au milieu, plus long que le 3e, un peu aminci à l'extrémité, 3–5 fusiformes, 2.5 fois aussi longs que gros, verticilles à 4 ou 5 poils longs, ceux du 5e article dépassent un peu le milieu du 6e article, celui-ci un peu plus de deux fois aussi long que le 5e. Balanciers brun noir. Aile de la ♀ n'atteignant pas l'extrémité de l'abdomen, enfumée faiblement, avec une bande blanchâtre transversale, allant du milieu de la tige de la posticale au bord postérieur de l'aile, et une autre occupant la moitié distale de la cellule posticale et traversant la partie distale de la cellule discoïdale et de la cellule cubitale, maïs l'extrême bout distal de ces deux dernières cellules reste enfumé; base alaire faiblement lobée; surface finement pointillée, un peu plus sombre le long du bord antérieur, radiale et cubitale á soies; cubitale un peu plus de deux fois la radiale, droite, plus proche de la pointe alaire que la rameau antérieur de la posticale, bifurcation de celle-ci distale de deux fois la longueur de la transversale; aile du ♂ subhyaline, à peine assombrie le long du bord antérieur. Pattes noires, trochanters blanchâtres, moitié proximale du métatarse antérieur, et les quatre tarses postérieurs blancs, ceux-ci ont l'extrémité des articles 1–3 et les articles 4 et 5 bruns; tarse antérieur non barbu, métatarse de deux tiers plus long que le tibia, plus de deux fois le 2e, 2–5 graduellement raccourcis, 5e encore 5 à 6 fois aussi long que gros, au tarse intermédiaire le 4e et le 5e à peine plus longs que gros, au tarse postérieur le 4e de moitié plus long que le 5e, celui-ci de deux tiers plus long que gros, empodium à peine plus long que les pulvilles, plus court que les crochets; tibia antérieur avec une écaille pointue; peigne des 4 tibias postérieurs occupant les trois quarts du pourtour, à 2 éperons courts. Abdomen de la ♀ arqué, d'un tiers plus long que le reste du corps; cerci

d'un blanc pur. Abdomen du ♂ très grêle, au moins deux fois aussi long que le reste du corps, les 5 premiers tergites blanchâtres sur le dessous, segments allongés. Pince à articles terminaux blancs, articles basaux et lamelle brun noir, comme les appendices inférieurs; lamelle largement arrondie et sans pointe; articles terminaux bien plus longs que les basaux, très minces dans les deux tiers proximaux, tiers distal deux fois plus gros, renflé en massue, muni à son côté médial de sept soies alignées longitudinalement et, à son extrémité, d'une soie plus courte; côté latéral des articles à poils épars et très longs; appendices supérieurs insérés près de l'extrémité des articles basaux, qu'ils dépassent, jaunes, glabres, transparents, très minces à leur base, graduellement élargis jusqu'à l'extrémité, oú ils sont plus de deux fois aussi larges que la base des articles terminaux; appendices inférieurs minces, en forme de lanière, arqués, atteignant presque le milieu des articles terminaux, leur extrémité renflée en massue et portant dorsalement de longs poils arqués.

Longueur, ♂ 4.5 millimètres; ♀, 3.5 millimètres.

Philippines, Luzon, Laguna, Los Baños, plus de 100 exemplaires.

Genus **PHYTOCHIRONOMUS** Kieffer

Phytochironomus philippinarum sp. nov.

Femelle et mâle.—Jaune sale ou jaune brunâtre. Tête un peu transversale vue de devant. Yeux très arqués, très amincis en haut, où ils sont séparés de deux fois leur largeur terminale (♂). Palpes longs, 1er article pas plus long que gros, 2^{e} double du 1er, 3^{e} de moitié plus long que le 2^{e}, 4^{e} de moitié plus long que le 3^{e}. Antennes du ♂ brunes, à panache gris brun, scapes noirs ou jaunes, se touchant, 2^{e} article deux fois aussi long que le 3^{e}, 3–11 très transversaux, trois fois aussi gros que longs, 12^{e} presque quatre fois aussi long que 2–11 réunis. Yeux de la ♀ plus amincis en haut que chez le ♂ et séparés de 3–4 fois leur largeur terminale, partie amincie 2–3 fois aussi longue que large. Antenne de la ♀ de 6 articles, 2^{e} article de moitié plus long que le 3^{e}, rétréci au milieu, à col aussi long que gros, 3^{e} le plus court, graduellement aminci distalement et sans col, 4^{e} et 5^{e} fusiformes, col un peu plus long que gros, verticilles de six poils, ceux du 5^{e} article atteignent le milieu du 6^{e}, celui-ci de moitié plus long que le 5^{e}. Mesonotum blanchâtre et pruineux, comme le scutellum, avec trois bandes raccourcies fauves. Aile hyaline, atteignant à peine le 6^{e} tergite (♂ et ♀), transversale

distale du milieu, brun noir, cubitale d'un tiers plus longue que la radiale, droite, aboutissant peu avant la pointe alaire, deux fois plus loin que la discoïdale, bifurcation sous la transversale, lobe rectangulaire. Article terminal des tarses assombri; tarse antérieur barbu chez le ♂, tibia antérieur à peine plus court que le fémur, à écaille obtuse, graduellement amincie, de moitié plus longue que large, métatarse de moitié plus long que le tibia, deux fois le 2e, 2–5 graduellement un peu raccourcis, 5e cinq fois aussi long que gros, pulvilles atteignant presque le milieu des crochets, allongés, à poils longs; empodium dépassant le milieu des crochets. Abdomen unicolore, celui-du ♂ deux fois aussi long que le reste du corps, segments 2–7 allongés, segment anal graduellement aminci en avant; abdomen de la ♀ presque aussi gros que le thorax, droit, 2.5 fois aussi long que le reste du corps, segments à peine transversaux; le segment anal a dorsalement, à chaque angle du bord postérieur, un petit lobe brun, graduellement aminci et un peu plus long que les cerci, à poils longs et denses; dessous du même segment á deux lobes se touchant presque; cerci bruns. Pince du ♂ ayant la pointe de la lamelle noire; articles terminaux un peu plus longs et aussi larges que les basaux, un peu amincis au tiers distal, côté médial droit, à poils assez denses dans son tiers distal, côté latéral très convexe; appendices supérieurs longs, très minces, arqués, dépassant l'article basal; appendices inférieurs dépassant le milieu des articles terminaux, peu larges, sauf un peu plus de tiers distal qui est élargi en massue, un peu courbé et portant dorsalement, sur un côté, des poils bruns, arqués, longs et gros, sur l'autre côté des poils droits, bien plus fins et un peu plus courts.

Longueur, ♂, 5 millimètres; ♀, 6–7 millimètres.

Philippines, Luzon, Laguna, Los Baños, plus de 100 exemplaires.

Proche de *tainanus* Kieff., qui en diffère par les appendices inférieurs de la pince pointus au bout, par la lamelle à pointe concolore et par la couleur de l'abdomen.

Genus KRIBIODOXA Kieffer

Kribiodoxa pulchripennis sp. nov.

Femelle.—Brun noir. Antenne jaunâtre, de 6 articles; scape brun, 3e et 4e article graduellement amincis distalement, 5e ellipsoïdale, à verticille de cinq poils atteignant l'extrémité du 6e article, celui-ci deux fois aussi long que le 5e, avec un poil distal égalant sa demi-longueur. Thorax s'avançant presque en bec au-dessus de la tête. Balanciers blancs. Aile blanche, non

transparente, sans lobe, à taches d'un noir profond, dont la plus grande est presque carrée, à peine transversale, aussi large que la longueur du rameau postérieur de la posticale, également distante de la pointe alaire et de l'origine de la discoïdale, reliant le bord antérieur au rameau antérieur de la posticale, elle est traversée par la discoïdale, qui est blanche en entier; une seconde tache subcarrée, petite, située contre la nervure médiane, s'arrêtant à l'origine de la cubitale et ne touchant pas la tige de la posticale; une 3e, égale à la 2e, est située dans la cellule posticale, contre le milieu du rameau antérieur et fait suite à la 1e; une 4e, allongée en forme de bande longitudinale et étroite, est située dans la cellule anale, un peu plus distante du bord inférieur et du rameau postérieur que de la tige de la posticale; cubitale droite, très rapprochée de la costale, aboutissant à peine plus près de la pointe alaire que le rameau antérieur de la posticale; transversale pâle, proximale du milieu de l'aile, bifurcation de la posticale distale de la longueur du rameau postérieur, celui-ci oblique, l'antérieur continue la direction de la tige. Pattes blanches, moitié distale des fémurs brun noir, empodium très court, pas de pulvilles, peignes occupant les deux tiers du pourtour, à deux éperons courts. Abdomen noir mat, fortement comprimé, guère plus long que le reste du corps.

Longueur, 1 millimètre.

Philippines, Luzon, Laguna, Los Baños, c'est à ce genre qu'il faut rapporter aussi les trois insectes de Formose, que j'ai décrits sous les noms de *Paratendipes nigrofasciatus*, *P. concoloripes* et *P. astictus*.

Genus **ENDOCHIRONOMUS** Kieffer, 1918

Il faut rapporter à ce genre *Chironomus pekanus* Kieff. de Formose. Les caractères de ce genre sont: Antennes de 14 articles chez le ♂, de 7 chez la ♀; tibia antérieur avec une écaille distale terminée par un petit éperon; articles terminaux de la pince sans rangée distale de soies rigides au côté médian, appendices inférieurs dépassant les articles basaux, à longs poils dorsaux et incurvés. Le type est: *Chironomus alismatis* Kieff.; il faut encore y ajouter les espéces européennes suivantes; *bryozoarum* K., *danicus* K., *dispar* Meig., *calolabis* K., *leucolabis* K., type, *longiclava* K., *meinerti* K. (sub *Glyptotendipes*), *miki* K., *nymphella* K., *nymphoides* K., *occultus* K., *signaticornis* K., *sparganii* K. (*nymphaeæ* Will. ? larve et nymphe), *tendens* Fabr., et *xantholabis* K.

Genus CHIRONOMUS Meigen

Chironomus sauterianus sp. nov.

Mâle.—Brun noir. Yeux amincis en haut, très arqués, séparés par leur largeur terminale. Palpes longs. Antennes brun clair, comme le panache, scape noir, articles 3–11 transversaux, 12e un peu plus de deux fois aussi long que 2–11 réunis. Lobes frontaux distincts. Mesonotum brun roux, brillant, a trois bandes raccourcies brun noir. Balanciers blancs, extrémité de la massue brun noir. Aile hyaline, lobe à angle droit, nervures jaunâtres, cubitale aussi près de la pointe alaire que la discoïdale, bifurcation de la posticale notablement distale. Pattes jaunâtres, tarse antérieur et deux ou trois derniers articles des autres tarses assombris, articles 2–4 du tarse antérieur barbus, poils 3–4 fois aussi longs que la grosseur des articles, métatarse de moitié ou presque de deux tiers plus long que le tibia, 2–4 graduellement raccourcis, empodium dépassant un peu le milieu des crochets, pulvilles égalant l'empodium, larges, à longs poils; peignes occupant les $\frac{4}{5}$ du pourtour, les deux éperons courts. Abdomen graduellement élargi en arrière, tergites 2–6 allongés, deux fois aussi longs que larges, 7e de moitié plus long que large, très élargi, 8e un peu plus long que large, graduellement aminci en avant, bien plus mince que le précédent. Pince aussi mince que le 8e segment; articles terminaux plus longs que les basaux, arqués, peu larges, graduellement élargis dans la moitié proximale, partie distale ayant au côté médian six soies rigides alignées, extrémité avec une soie plus courte; appendice supérieur inséré près de l'extrémité des articles basaux, arqués, courts, très minces; appendice inférieur dépassant le tiers basal des articles terminaux, un peu élargi au bout, où il porte dorsalement de longs poils arqués; lamelle avec une longue pointe.

Longueur, 5 millimètres.

Formose, Taihoku, 7 novembre 1912.

Chironomus aurantiacus sp. nov.

Femelle.—Jaune orangé et mat. Yeux séparés de leur largeur terminale. Lobes frontaux presque ponctiformes. Antennes jaunes, 6e article assombri, de deux tiers plus long que le 5e, 2e rétréci au milieu, col aussi long que gros, 3–5 à col allongé. Mesonotum blanchâtre, à trois bandes raccourcies d'un jaune roux, la médiane un peu luisante. Aile blanche, nervures blanchâtres, transversale noire, lobe rectangulaire, cubitale aussi proche de la pointe alaire que la discoïdale, bifurcation de la posticale sous la transversale. Pattes d'un blanc pur, hanches

fauves, fémurs blanc jaunâtre, extrémité des tibias et des quatre premiers articles tarsaux ainsi que le 5e article bruns; métatarse antérieur de deux tiers plus long que le tibia, deux fois le 2e, 3e plus court que le 2e, 4e au moins de moitié plus long que le 3e, deux fois et demie aussi long que le 5e. Abdomen comprimé et arqué.

Longueur, 4 millimètres.

Formose, Taihoku, 7 novembre 1912.

Chironomus circumdatus Kieff.

Mâle et femelle.—Yeux séparés de leur largeur terminale; tibia antérieur beaucoup plus court que le fémur.

Formose, Daitotei, juin 1914; Taihoku, 7 november 1912; 12 ♂ ♂, 14 ♀ ♀.

Var. **anomalus** var. nov.

Mâle et femelle.—Articles 2e et 3e du tarse antérieur subégaux, le 4e distinctement plus long que le 3e, plus de deux fois aussi long que le 5e, tous deux d'un brun noir; les deux éperons des tibias postérieurs très courts, comme chez le type. Quant au reste, semblable au type.

Longueur, ♂, 5–6 millimètres; ♀, 4 millimètres.

Formose, Daitotei et Taihoku.

Chironomus inermifrons Kieff.

Femelle.—Yeux tres arqués, amincis en haut, distants au plus de leur largeur terminale. Nervures jaunâtres, cubitale aussi près de la pointe alaire que la discoïdale, 2e longitudinale aboutissant plus près de la radiale que de la cubitale, lobe rectangulaire. Pulvilles à longs poils, dépassant un peu le milieu des crochets, aussi longs que l'empodium.

Formose, Anping, en octobre 1912.

Chironomus chlorophorus Kieff.

Mâle.—Tarse antérieur assombri, non barbu, métatarse au moins de moitié plus long que le tibia, deux fois le 2e article, 4e double du 5e, plus court que le 3e. Tergites 3–6 allongés, 7e aussi long que large, brunâtre comme le 8e, celui-ci graduellement aminci en avant. Pince brunâtre, articles terminaux blanchâtres.

Formose, Anping, en octobre 1912.

Genus **CARTERIA** novum

Caractères comme *Chironomus* sauf: Pulvilles rameux dès leur base; articles terminaux de la pince très larges et courts, sans rangée de soies rigides, à contour obovalaire, avec un petit

ongle triangulaire au bout, appendices inférieurs très longs, lamelle dèpourvue de pointe.

Type, *Chironomus longilobus* Kieff.

Ce genre est dédié au diptérologiste anglais H. F. Carter, F. E. S.

Carteria longilobus Kieff. var. fulviventris var. nov.

Mâle.—Jaunâtre. Yeux arqués, amincis en haut et séparés par leur largeur terminale. Palpes longs. Antennes brunâtres, panache fauve, scape jaune, 2e article deux fois aussi long que le 3e, 3–11 un peu transversaux, 12e deux fois aussi long que 2–11 réunis. Thorax brillant, trois bandes raccourcies du mesonotum, metanotum et mesosternum d'un jaune plus foncé. Balanciers blanchâtres. Aile hyaline, à lobe rectangulaire, nervures pâles, cubitale presque aussi près de la pointe alaire que la discoïdale, bifurcation de la posticale un peu distale de la transversale, celle-ci au milieu de l'aile. Pattes blanchâtres, extrémité du fémur antérieur, moitié basale du tibia antérieur, son extrémité et le tarse un peu obscurcis, métatarse de deux tiers plus long que le tibia, 2e article un peu plus long que le tibia, 3e plus court que le 2e, subégal au 4e, celui-ci double du 5e; peignes occupant les trois quarts du pourtour, les deux éperons courts; pulvilles atteignant les deux tiers des crochets, larges, rameux, les rameaux sortant tous de la base, empodium mince. Abdomen entièrement jaune sale, comme la pince. Celle-ci conformée comme chez le type, sauf les appendices inférieurs, dont des deux tiers proximaux sont presque trois fois aussi larges que les appendices supérieurs, tiers distal élargi en demi-cercle; chez le type, les appendices inférieurs ont leur moitié distale un peu élargie, 2.5 fois aussi longue que large et graduellement amincie en pointe, leur moitié basale non deux fois aussi large que les appendices supérieurs, lamelle obtuse, mais presque triangulaire chez le type, tandis qu'elle est largement arrondie en arrière chez la variété.

Longueur, 3 millimètres.

Formose, Anping.

Genus DITANYTARSUS Kieffer

Ditanytarsus formosanus Kieff. (sub *Tanytarsus*).

Mâle et femelle.—Yeux très arqués, graduellement amincis, distants de leur demi-longueur ou de 5 fois leur largeur terminale. Eperon du tibia antérieur aussi long que la demi-grosseur du tibia.

Formose, Anping, 16 ♂ ♂, 2 ♀ ♀.

Genus **RHEOTANYTARSUS** Bause

Rheotanytarsus formosæ sp. nov.

Mâle et femelle.—Vert (♂) ou jaune verdâtre (♀). Yeux très arqués, séparés de trois quarts de leur longueur. Palpes longs, articles 1–4 graduellement plus longs. Antennes du ♂ grises comme le panache, articles 2–13 graduellement plus longs, les premiers un peu transversaux, les derniers presque deux fois aussi longs que gros, 14e à peine égal à 2–13 réunis. Antennes de la ♀ jaunâtres, de 5 articles, dont le 2e un peu rétréci au milieu, presque deux fois aussi long que le 3e, les suivants ellipsoïdaux, verticilles à 5 ou 6 longs poils, ceux du 4e article dépassent le 5e, celui-ci deux fois et demie aussi long que le 4e, un peu grossi au-dessus de la base et muni à cet endroit d'un verticille double de 6 longs poils, extrémité avec un poil médiocre. Mesonotum avec trois bandes raccourcies jaunes. Balanciers blancs. Aile hyaline, glabre, non lobée, extrémité de la cellule cubitale et de la cellule discoïdale, ainsi que le milieu du tiers distal de la cellule discoïdale à longs poils, cette pilosité un peu plus étendue dans les trois mêmes cellules chez la ♀ que chez le ♂; transversale comme chez *Chironomus*, cubitale droite, plus proche de la pointe alaire que le rameau antérieur de la posticale, bifurcation un peu distale, un peu proximale du milieu de l'aile. Pattes blanches, 4 tibias postérieurs à longs poils, tibia antérieur égalant la moitié du fémur, métatarse un peu plus de deux fois aussi long que le tibia, double du 2e, 2–4 graduellement raccourcis, 4e de deux tiers plus long que le 5e, pulvilles nuls, empodium très court, éperon du tibia antérieur aussi long que la demi-grosseur du tibia, peignes des 4 tibias postérieurs séparés, courts, chacun avec un éperon. Abdomen du ♂ élargi en arrière, segment anal graduellement aminci en avant, subtriangulaire. Pince verte comme l'abdomen, articles terminaux graduellement amincis distalement, appendices inférieurs dépassant les articles basaux, à longs poils dorsaux arqués; brosse courte, à poils simples; lamelle graduellement amincie en pointe.

Longueur, ♂, 1.8 millimètres; ♀, 1.2 millimètres.

Formose, Anping, octobre 1912, 8 ♂ ♂, 1 ♀.

Genus **PENTAPEDILUM** Kieffer

Pentapedilum pygmæum sp. nov.

Femelle.—Blanc sale, à poils gris, nombreux et longs. Antennes de 6 articles, dont les deux derniers sont soudés, 2e plus de moitié plus long que le 3e, subcylindrique, à peine aminci au

bout; 3e et 4e avec un col un peu plus long que gros, nodosité à peine plus longue que grosse; 5e globuleux; verticilles à 8 ou 9 longs poils, ceux du 5e article dépasse le 6e, celui-ci soudé au 5e, mais très mince et plus de trois fois aussi long que lui, avec deux poils distaux aussi longs que l'article. Thorax dépassant de beaucoup la tête en avant. Aile très velue de gris, graduellement amincie à la base, transversale oblique comme chez *Chironomus*, cubitale dépassant la radiale de plus d'un tiers, aboutissant près de la pointe alaire, discoïdale aboutissant à la pointe alaire, bifurcation assez distale. Balanciers blancs. Pattes blanchâtres, fémur antérieur d'un tiers plus long que le tibia, métatarse de deux tiers plus long que le tibia, double du 2e article, 2–4 graduellement un peu raccourcis, 4e de moitié plus long que le 5e, empodium égalant presque les crochets, à poils ventraux bifurqués, pulvilles un peu plus courts que l'empodium, probablement à 4; tibia antérieur avec une écaille graduellement amincie et un peu plus longue que large; pattes postérieures à longs poils, peignes du tibia occupant les trois quarts du pourtour, éperon unique, plus long que la grosseur du tibia.

Longueur, 1 millimètre.

Formose, Anping, octobre 1912, 4 ♀ ♀.

FUNGI SINENSIS ALIQUOT A CL. PROF. OTTO A. REINKING COLLECTI ET COMMUNICATI

Par P. A. Saccardo

Padova, Italy

A. TELEOMYCETAE

HYMENOMYCETINEAE

SCHIZOPHYLLUM Fries

SCHIZOPHYLLUM COMMUNE Fr. Syll. Fung. 5: 655.

Hab. in ramis emortuis Mori albae (4623).

Kwang Tung, Heung Shan, *Reinking 4623*, May 27, 1919.

PSATHYRA Fries.

PSATHYRA SPADICEO-GRISEA (Schäff.) Quél. Syll. Fung. 5: 1065.

Hab. ad terram (4553).

Kwang Tung, Tung San Pang, *Reinking 4553*, May 26, 1919.

PUCCINIACEAE

PUCCINIA Persoon

PUCCINIA PRUNI-SPINOSAE Pers. [Uredosporae] Syll. Fung. 7: 648.

Hab. in folliis vivis Pruni persicae (4718).

Kwang Tung, Canton, *Reinking 4718*, May 7, 1919.

PUCCINIA LONGICORNIS Pat. et Har. [Uredosporae] Syll. Fung. 11: 200.

Hab. in foliis vivis Bambusae sp. (3953).

Fukien, Foochow, *Skvortzow 3953*, June, 1918.

KUEHNEOLA P. Magnus

KUEHNEOLA FICI (Cast.) Butl. [Uredosporae] Syll. Fung. 7: 847 (*Uredo*).

Hab. in foliis vivis Fici Caricae (4730).

Kwang Tung, Canton, *Reinking 4730*, May 7, 1919.

KUENHNEOLA MORICOLA P. Henn. [Uredosporae] Syll. Fung. 17: 451. (*Uredo*).

Hab. in foliis vivis Mori albae (4632).

Kwang Tung, Canton, *Reinking 4632*, June 15, 1919.

SPHAEROPHRAGMIUM P. Magnus

SPHAEROPHRAGMIUM ACACIAE (Cke.) Magn. [Teleutosp. et Uredosp.] Syll. Fung. 11: 209.

Hab. in foliis vivis Albizziae Lebbek (3962).
Fukien, Foochow, *Skvortzow 3962*, June, 1918.

USTILAGINACEAE

USTILAGO Persoon

USTILAGO PENNISETI Rabenh. Syll. Fung. 7: 462.

Hab. in ovariis Penniseti sp. (3956).
Fukien, Foochow, *Skvortzow 3956*, June, 1918.

USTILAGO SACCHARI Rabenh. Syll. Fung. 7: 456.

Hab. in vaginis et interiore culmi Sacchari officinarum (4679).
Kwang Tung, Paak Shan, *Reinking 4679*, May 16, 1919.

PERONOSPORACEAE

PERONOPLASMOPARA (Berlese) Clinton

PERONOPLASMOPARA CUBENSIS (Berk. et Curt.) Clint.

Peronospora cubensis B. et C. Syll. Fung. 7: 261 (*Peronospora*).

Hab. in foliis vivis Cucumeris sativi (4633, 4634) et Cucurbitae maximae (4701).

Kwang Si, Tang Uen, *Reinking 4633*, June 8, 1919; Kwang Tung, Canton, *Reinking 4634*, May 8, 1919; Kwang Tung, Heung Shan, *Reinking 4701*, May 27, 1919.

SPHAERIACEAE

PHYSALOSPORA Niessl

PHYSALOSPORA REINKINGIANA Sacc. sp. nov.

Peritheciis globulosis, subcutaneis, saepius gregatim seriatis, 200–250 μ diam., vix palpillatis, nigris, initio intus albis, contextu pachydermatico, indistincte celluloso, fuligineo, ascis tereti-clavatis, breviter sensim stipitatis, 115–120 x 12, obsolete paraphysatis, 8-sporis; sporidiis oblique monostichis v. distichis, fusiformibus, rectis curvulisve 30–33 x 5.5–6, raro brevioribus, intus nubilosis, hyalinis.

Hab. in culmis emortuis Bambusae vulgaris, socio Melanconio sphaerospermo (4738). Imprimis sporidiis fusoideis, longis dignoscenda, et a Phys. Bambusae omnio diversa.

Kwang Tung, Canton, *Reinking 4738*, May 14, 1919.

PHYSALOSPORA PROPINQUA Sacc. sp. nov.

Peritheciis gregariis, saepius seriatis, globulosis, obtuse papillatis, subcutaneo-erumpentibus, prominulis, intus albis, 0.25–0.33 mm diam., ascis crasse clavatis, breviter stipitatis, crasse tunicatis, 85–95 x 18-20, octosporis, obsolete paraphysatis; sporidiis distichis, oblongo-fusoideis, saepe inaequilateris, utrinque obtuse tenuatis, 18–20 x 6, hyalinis.

Hab. in ramis emortuis Ricini communis (4676). Affinis Ph. gregariae, sed sporidiis subfusoideis, angustioribus et Ph. Reinkingiana sed sporidiis brevioribus diversa.

Kwang Tung, Canton, *Reinking 4676,* May 12, 1919.

ANTHOSTOMELLA Saccardo

ANTHOSTOMELLA PROFUNDA Sacc, sp. nov.

Peritheciis gregariis, strato ligneo profunde immersis, globulosis, 0.5–0.7 mm diam., et collo longiusculo, cylindrico, matricis superficiem circulariter e sporis nigro-foedatam, attingentibus, contextu molliusculo, olivaceo-fusco; ascis cylindricis, breviter stipitatis, apice rotundatis, 140–150 x 9–10, filiformi paraphysatis, octosporis; sporidiis, recte monostichis, ellipsoideis 14 x 9, fuligineis, initio strato hyalino obvolutis.

Hab. in culmis emortuis Bambusae sp. (4733). A ceteris congeneribus bambusicolis diversa.

Kwang Tung, Canton, *Reinking 4733,* May 12, 1919.

DIDYMOSPHAERIA Fuckel

DIDYMOSPHAERIA INFOSSA Sacc. sp. nov.

Peritheciis gregariis strato ligneo profunde immersis, globulosis 0.3–0.5 mm diam. et collo elongato, cylindrico matricis superficiem attingentibus, nigris, contextu minute celluloso, fuligines; ascis cylindraceis, brevissime stipitatis, apice rotundatis, 190–200 x 12, 8-sporis, obsolete paraphysatis; sporidiis monostichis, fusoideis, utrinque acutatis, rectis v. inaequilateris, 1-septatis, non constrictis, 28 x 8; eximie longitrorsum striatis, olivaceis v. fusco-olivaceis.

Hab. in culmis emortuis Bambusae vulgaris (4732). A ceteris speciebus bambusicolis rite dignoscenda; cum praecedente situ peritheciorum mire convenit, etsi diversissima.

Kwang Tung, Canton, *Reinking 4732,* May 12, 1919.

DIDYMELLA Saccardo

DIDYMELLA EUMORPHA (B. et C.) Sacc. Syll. Fung. 1: 560.

Asci paraphysati, 45–50 x 8–10; sporidia 11–12 x 2, 3–2, 5, saepe curvula, fusoidea.

Hab. in culmis Bambusae sp. (4688).

Kwang Tung, Canton, *Reinking 4688,* May 7, 1919.

APIOSPORA Saccardo

APIOSPORA MONTAGNEI Sacc. Syll. Fung. 1: 539.

Hab. in culmis emortuis Bambusae sp. (4694).

Kwang Tung, Canton, *Reinking 4694,* May 20, 1919.

METASPHAERIA Saccardo

METASPHAERIA CONOIDEA Sacc. sp. nov.

Peritheciis gregariis, globoso-conicis, erumpentibus, nigris, 0.5 mm diam., duriusculis, ostiolo subrostellato emergenti; ascis cylindricis, 170–180 x 8–9, octosporis, breviter stipitatis; sporidiis oblique monostichis, oblongo-fusoideis, utrinque acutulis, interdum inaequilateris, 3-septatis, non constrictis, 4-guttatis, 26 x 7, hyalinis.

Hab. in ramis emortuis Psidii guajavae (4672).

Kwang Si, Tang Uen, *Reinking 4672,* June 7, 1919.

PERONEUTYPA Saccardo

PERONEUTYPA HETERACANTHA Sacc. Syll. Fung. 1: 177 (*Eutypa*).

Hab. in ramis emortuis Citri nobilis (4508).

Kwang Si, Tang Uen, *Reinking 4508,* June 7, 1919.

EUTYPELLA Nitschke

EUTYPELLA CITRICOLA Speg. Syll. Fung. 16: 423. Forma *eutypa.*

Hab. in ramis emortuis Citri grandis (4576).

Kwang Si, Tang Uen, *Reinking 4576,* June 7, 1919.

EUTYPELLA BAMBUSINA Penz. et Sacc. Syll. Fung. 14: 486 (*Eutypa*).

Asci clavulati, 23–25 x 4, 5 p. sporif., sporidia allantoidea, 5–6 x 1, 5–1, 8, hyalina curvula.

Hab. in culmis emortuis Bambusae sp. (4609 et 4696).

Kwang Tung, Canton, *Reinking 4609, 4696,* May, 1919.

DIATRYPELLA Ces. et de Notaris

DIATRYPELLA VERRUCIFORMIS (Ehrb.) Nke. Syll. Fung. 1: 201.

Hab. in ramis emortuis Mori albae (4705).

Kwang Si, Tang Uen, *Reinking 4705,* June 8, 1919.

HYPOXYLON Bulliard

HYPOXYLON SERPENS (Pers.) Fr. Syll. Fung. 1: 378.

Hab. in radicibus emortuis Punicae granati (3960), Citri nobilis (4567) et arboris indet. (4683).

Fukien, Foochow, *Skvortzow 3960,* June, 1918. Kwang Si, Tang Uen, *Reinking 4567,* June 7, 1919. Kwang Tung, Teng Oo, *Reinking 4683,* June 12, 1919.

NUMMULARIA Tulasne

NUMMULARIA PUNCTULATA (B. et Rav.) Sacc. Syll. Fung. 1: 399.

Hab. in trunco non determinato (4604).

Kwang Tung, Canton, *Reinking 4604,* May 20, 1919.

HYPOCREACEAE

STILBONECTRIA Karsten

STILBONECTRIA LATERITIA Karst. Syll. Fung. 9: 986.

Hab. in ramis emortuis Manihot utilissimae, socio Stilbo lateritio (4636); in cortice indeterm. (4558).

Kwang Tung, Heung Shan, *Reinking 4558,* May 27, 1919: Kwang Tung, Tung San Pang, *Reinking 4636,* May 26, 1919.

MEGALONECTRIA Saccardo

MEGALONECTRIA PSEUDOTRICHIA (Schw.) Speg. Syll. Fung. 2: 560; var. **OLIGOSPORA** Sacc. var. nov.

Ascis tetrasporis, 90–105 x 18; sporidiis 30–35 x 12 cribroso, 6 ad 7-septatis, dilutissime fuscis.

Hab. in cortice indeterm.

HYPONECTRIA Saccardo

HYPONECTRIA SINENSIS Sacc. sp. nov.

Maculis corticalibus subalutaceis, versiformibus; perithéciis dense gregariis, subcutaneis, globulosis, 0.20–0.25 mm diam., pallidis, ostiolo subumbilicato albo erumpenti; centextu laxe celluloso, sordide aureo; ascis cylindraceis, breviter stipitatis, 130–150 x 17–19, apice rotundatis, tunica initio incrassata praeditis, paraphysibus diffluentibus, octosporis; sporidiis oblique monostichis oblongo-limoniformibus, apicibus brevissime apiculatis, rectis v. inaequilateris, 28 x 12, hyalinis, farctis.

Hab. in ramis morientibus Citri sp. (4670). Ad genus Physalosporinam nutat.

Kwang Tung, Paak Shan, *Reinking 4670,* May 16, 1919.

DOTHIDEACEAE

DOTHIDEA Fries

DOTHIDEA TETRASPORA B. et Br. Syll. Fung. 2: 640; var. **CITRICOLA** Sacc. var. nov.

Sporidiis quam typi paullo brevioribus, 16 x 7, rufo-fuligineis, articulis subaequalibus; ascis 70 x 11–12.

Hab. in trunco emortuo Citri trifoliatae (3961).

Fukien, Foochow, *Skvortzow 3961*, June, 1918.

PHYLLACHORA Nitschke

PHYLLACHORA SINENSIS Sacc. sp. nov.

Stromatibus minutis, subcircularibus, amphigenis in maculis flavidis innatis, paucilocularibus, loculis epiphyleis non v. vix emergentibus; ascis cylindricis, praelongis, 190 x 9–11; sporidiis monostichis, fusoideis, utrinque obtusatis, 28 x 9; hyalinis, farctis.

Hab. in foliis vivis Bambusae sp. (3958). Phyll. eximiae Syd. (in Arundinaria) affinis, differt imprimis ascis multo angustioribus.

Fukien, Foochow, *Skvortzow 3958*, June, 1918.

B. DEUTEROMYCETAE

HYSTERIINEAE

GLONIOPSIS de Notaris

GLONIOPSIS AUSTRALIS (Duby) Sacc. Syll. Fung. 2: 774 et 9: 117.

Hab. in ramis emortuis Pruni Persicae (4671).

Kwang Tung, Tung San Pang, *Reinking 4671*, May 26, 1919.

HYSTEROGRAPHIUM Corda

HYSTEROGRAPHIUM MORI (Schw.) Rehm. Fung. 2: 783.

Hab. in ramis emortuis Mori albae (4679). Videtur haec species, sed asci immaturi.

Kwang Tung, Canton, *Reinking 4679*, May, 1919.

SPHAERIOIDACEAE

APOSPHAERIA Berkeley

APOSPHAERIA FUGAX Sacc. sp. nov.

Pycnidiis gregariis, subepidermicis sed mox liberis et facile secedentibus, globoso-lenticularibus 100–125 μ diam., nigris, valde regularibus, contextu minute celluloso olivaceo-fuligineo, ostiolo circularis 7–8 μ diam.; sporulis ovoideo-oblongis, 11–12

x 5, 5–6, guttulatis, hyalinis; conidiophoris acicularibus, 5–7 x 2–3, hyalinis.

Hab. in ramis emortuis Manihot utilissimae (4650).
Kwang Tung, Canton, *Reinking 4650,* June 15, 1919.

APOSPHAERIA FUSCO-MACULANS Sacc. Syll. Fung. 3: 174.

Hab. in ramis emortuis Pruni Persicae (4734).
Kwang Tung, Canton, *Reinking 4734,* May 7, 1919.

PHOMA (Fr.) Desmaziere

PHOMA MEDIA Ell. et Ev. Syll. 10: 184.

Sporulae fusoideae 12 x 24, hyalinae.
Hab. in caulibus emortuis Asparagi officinalis (3967).
Fukien, Foochow, *Skvortzow 3967,* June, 1918.

SPHAERONAEMA Fries

SPHAERONAEMA REINKINGII Sacc. sp. nov.

Pycnidiis gregariis e basi incrassata latenti, subulato-conicis, erumpentibus, nigris, fragilibus, 0.50–0.75 mm, altis, carbonaceis, apice obtusulis; sporulis cylindraceis, utrinque rotundatis, rectis, 8 x 3 hyalinis, sporophoris bacillaribus, raro furcatis, 23–26 x 2, 3, hyalinis.

Hab. in ramis emortuis Aleuritis moluccanae (4668). Pycnidii contextus obscure parenchymaticus non fibrosus.
Kwang Si, Tang Uen, *Reinking 4668,* June 7, 1919.

SPHAERONAEMA REINKINGII Sacc. var. CITRICOLA Sacc. var. nov.

A typo dignoscitur pycnidiis basi profundiis infossis globosisque, rostro aequali; sporulis paullo majoribus, obtusioribus, medioque interdum leviter constrictis, 10 x 4. 5–5.

Hab. in ramis emortuis Citri grandis (4568). Rectius forte specifice distinguenda species.
Kwang Si, Tang Uen, *Reinking 4568,* June 7, 1919.

SPHAEROPSIS Léveillé

SPHAEROPSIS MAGNOLIAE Magnaghi Syll. Fung. 16: 313.

Hab. in foliis emortuis Magnoliae sp. (3965).
Fukien, Foochow, *Skvortzow 3965,* June, 1918.

SPHAEROPSIS VALSOIDEA Cke. et Ell. Syll. Fung. 3: 299.

Hab. in ramis emortuis Mori albae (4720).
Kwang Tung, Sun Wai, *Reinking 4720,* May 23, 1919.

DIPLODIA Fries

DIPLODIA MORICOLA B. et C. Syll. Fung.

Hab. in ramis emortuis Mori albae (4704).
Kwang Si, Tang Uen, *Reinking 4704,* June 8, 1919.

DIPLODIA PERSICAE Sacc. Syll. Fung. 3: 341.

Hab. in ramis emortuis Pruni Persicae, socia Aposphaeria fuscomaculanti (4734).

Kwang Tung, Canton, *Reinking 4734*, May 7, 1919.

DIPLODIA MANIHOTI Sacc. Ann. Mycol. (1914): 310.

Hab. in ramis emortuis Manihot utilissimae (4637).

Kwang Tung, Tung San Pang, *Reinking 4637*, May 26, 1919.

PERISPORIACEAE

MICROXYPHIUM Saccardo

MICROXYPHIUM OBTUSULUM Sacc. sp. nov.

Epiphyllum, effusum, tenue, fuliginosum, secedens; hyphis modo repentibus, filiformibus, ramosis, modo erectis, moniliformibus 40–50 x 4–5, fuligineis; ceratopycnidiis cylindraceis, brevibus, simplicibus, apice obtusis, non v. vix fimbriatis, 50–90 x 20, atro-fuligineis; sporulis globulosis, hyalinis, 4–5 x 3–4.

Hab. in foliis vivis Psidii Guajava (4725).

Kwang Tung, Paak Shan, *Reinking 4725*, May 15, 1919.

MELANCONIACEAE

COLLETOTRICHUM Corda

COLLETOTRICHUM SEPTORIOIDES Sacc. sp. nov.

Acervulis punctiformibus, atris, erumpentibus, gregariis v. seriatis, 0.25–0.50 mm long.; setulis ex hypostromate dense, indistincte celluloso, fuligineo emergentibus, filiformibus, brevibus, continuis, fuligineis, 33 x 3–4, apice obtusulis; conidiis filiformibus, arcuatis, 14 x 1, 7, hyalinis, continuis; conidiophoris brevissimis.

Hab. in culmis emortuis Bambusae vulgaris (4743). Imprimis conidiis septorioideis distinguenda species.

Kwang Tung, Canton, *Reinking 4743*, May 12, 1919.

MELANCONIUM Link

MELANCONIUM SPHAEROSPERMUM (Pers.) Link. Syll. Fung. 3: 759.

Hab. in culmis morientibus Bambusae sp. (4687, 4697, 4708, 4710).

Kwang Tung, Canton, *Reinking 4687*, *4697*, *4708*, *4710*, May, 1919.

MELANCONIUM HYSTERINUM Sacc. Syll. Fung. 11: 572.

Hab. in culmis emortuis Bambusae sp. (4608).

Kwang Tung, Canton, *Reinking 4608*, May 20, 1919.

MELANCONIUM BAMBUSINUM Speg. Syll. Fung. 10: 479.

Hab. in culmis morientibus Bambusae sp. (3969). Conidia 22–24 x 14–15, nempe paullo minora quam in typo Spegazziniano, ubi indicantur 30 x 20.

Fukien, Foochow, *Skvortzow 3969*, June, 1918.

MELANCONIUM SACCHARI Cooke Syll. Fung. 14: 1019.

Hab. in culmis emortuis Sacchari officinarum (4699, 4739, 4740).

Kwang Tung, Canton, *Reinking 4699*, May 26, 1919; Kwang Tung, Paak Shan, *Reinking 4739, 4740*, May 16, 1919.

MELANCONIUM (ENDOCALYX) MELANOXANTHUM B. et Br. Syll. Fung. 3: 758. Cfr. Petch in Ann. Bot. 22 (1908) 389.

Hab. in petiolis emortuis Livistonae chinensis (4723).

Kwang Tung, Heung Shan, *Reinking 4723*, May 27, 1919.

EXOBASIDIINEAE

MICROSTROMA Niessl

MICROSTROMA MINIMUM Sacc. sp. nov.

Maculis amphigenis sed superne distinctioribus, circularibus, azescendo candidis, 2 mm diam., anguste fusco-marginatis; acervulis punctiformibus, candidis, ut videtur erumpentibus; conidiis oblongo ellipsoideis, 4, 5–5 x 2.5, hyalinis, conidiophoris acicularibus brevissimis et parum distinctis suffultis.

Hab. in foliis vivis Ricini communis (4719). A typo generis satis differt, imprimis forma conidiophorum.

Kwang Tung, Canton, *Reinking 4719*, May 12, 1919.

DEMATIACEAE

CONIOSPORIUM Link

CONIOSPORIUM BAMBUSAE (Thüm. et Bolle) Sacc. Syll. Fung. 4: 244.

Hab. in culmis emortuis Bambusae sp. socio Melanconio hysterino (4608).

Kwang Tung, Canton, *Reinking 4608*, May 20, 1919.

HADROTRICHUM Fuckel

HADROTRICHUM CAESPITULOSUM Sacc. sp. nov.

Caespitulis laxe gregariis, punctiformibus, nigris, interdum aliquot congestis, 100–150 μ diam., superficialibus, hypostromate pulvinato praeditis; conidiophoris ex hypostromate emergentibus, filiformibus, continuis v. parce septatis, 16–20 x 3.5–4, fuligineis, apice obtusulis; conidiis e fronte globosis, 10–12 μ diam., 1- ad 2-guttulatis, fuligineis, levibus, e latere 7 μ crassis.

Hab. in vaginis foliorum emortuorum Bambusae sp. (3968). Hypostromate pulvinato a typo generis recedit et ad Tuberculiaceas dematieas referri potest.

Fukien, Foochow, *Skvortzow 3968*, June, 1918.

TETRAPLOA Berkeley et Broome

TETRAPLOA ARISTATA B. et Br. Syll. Fung. 4: 516.

Hab. in culmis putrescentibus Bambusae sp. socia Didymella eumorpha, sed parce (4688).

Kwang Tung, Canton, *Reinking 4688*, May 7, 1919.

CLADOSPORIUM Link

CLADOSPORIUM HERBARUM (Pers.) Link. Syll. Fung. 4: 350; var. **LABLAB** Sacc. var. nov.

A typo imprimis distinguitur hyphis conidiisque sub microscopio olivaceo-tabacinis; conidiis modo continuis 5–7 x 3.5–4, modo fusoideis 1-septatis 18–20 x 7; hyphis 115–150 x 6, simplicibus, leviter flexuosis.

Hab. in leguminibus siccis Dolicis Lablab (3954).

Fukien, Foochow, *Skvortzow 3954*, June, 1918.

HELMINTHOSPORIUM Link

HELMINTHOSPORIUM CANTONENSE Sacc. sp. nov.

Effusum, olivaceo-nigrum, adpressum, maculiforme; conidiophoris erectis, simplicibus, ratione brevibus, 80–95 x 6 subseptatis, apice obtusulis, pallidioribus; conidiis obclavatis, 7- ad 9-septatis, ochraceo-fuligineis, 50–62 x 8, sursum obtusule cuspidatis, pallidioribus, saepe curvulis.

Hab. in culmis emortuis Bambusae sp. (4689).

Kwang Tung, Canton, *Reinking 4689*, May 7, 1919.

PODOSPORIUM Schweinitz

PODOSPORIUM MINUS Sacc. sp. nov.

Caespitulis dense et late gregariis, punctiformibus, nigris; synnematibus paucis fasciculatis, 500 μ altis, obclavatis, medio 30–40 μ crassis, basi duplo crassioribus, sursum in conidiophora filiformia 16–18 μ longa, patentia fuliginea solutis capitatisque; conidiis cylindraceis v. cylindraceo-clavatis, 5 ad 7-septatis, interdum subconstrictis, 35 x 6, 5–7, interdum usque ad 50 μ longis.

Hab. in culmis emortuis Bambusae sp. (4715). Podosporio japonica affine sed multo minus.

Kwang Tung, Canton, *Reinking 4715*, May 10, 1919.

STEMPHYLIUM Wallroth

STEMPHYLIUM MACROSPOROIDEUM (Berk.) Sacc. Syll. Fung. 4: 519.

Hab. in culmis emortuis Bambusae sp., socio Helminthosporio cantonensi (4689).

Kwang Tung, Canton, *Reinking 4689,* May 7, 1919.

CERCOSPORA Fries

CERCOSPORA BETICOLA Sacc. Syll. Fung. 2: 456.

Hab. in foliis Betae vulgaris (4625). Videtur ipsa, sed specimina nimis vetusta.

Kwang Tung, Canton, *Reinking 4625,* May 7, 1919.

CERCOSPORA HENNINGSII Allesch. Syll. Fung. 14: 1104.

Hab. in foliis Manihot utilissimae (4620).

Kwang Tung, Canton, *Reinking 4620,* May 15, 1919.

FUMAGO Persoon

FUMAGO VAGANS Pers. Syll. Fung. 4: 547.

Hab. in foliis vivis Pruni Persicae (4630).

Kwang Tung, Teng Oo, *Reinking 4630,* June 11, 1919.

STEIROCHAETE Broome et Caspini

STEIROCHAETE CAPSICI (Syd.) Sacc. (*Vermicularia Capsici* Syd.) Ann. Mycol. (1913): 329.

Pycnidium vere nullum, sed tantum hypostrona ut in aliis Vermiculariae speciebus; hinc ad Tubercullariaceas dematialas potius ducenda species.

Hab. in caulibus emortuis Capsici annui (4706).

Kwang Tung, Canton, *Reinking 4706,* May 15, 1919.

FUSARIUM Link

FUSARIUM MICROPUS Sacc. sp. nov.

Parasiticum (ut videtur) in Cladosporio, punctiforme, album, tenellum, conidiis, falcatis, utrinque acutis, initio 1-, dein 3-septatis, non constrictis, albo-hyalinis, 33 x 4.7; conidiophoris assurgentibus e parce mycelio, simplicibus 12 x 4, apice plerumque bidentatis, hyalinis.

Hab. parasitice in Cladosporio herbarum late effuso in foliis ramulisque Mori albae (4669). Forma a typo generis deflectens et ulterius inquirenda.

Kwang Tung, Canton, *Reinking 4669,* May 20, 1919.

KATYDIDS (TETTIGONIOIDEA) OF THE PHILIPPINE ISLANDS, COLLECTED BY C. F. BAKER

By H. H. KARNY
Of Buitenzorg, Java

Some years ago, Prof. Charles Fuller Baker sent to me some katydids from the Philippine Islands for determination. All of these specimens were collected in Laguna Province, Luzon. Hitherto I have not had the opportunity to examine this very interesting material, but now I have determined all the specimens and here present the complete list. It contains thirty species, of which eleven, indicated by the asterisk (*), were new to science; seven of the new species are described in another place [1] and four are described in this paper. The species new for the Philippine Islands are marked with a dagger (†).

COPIPHORINAE

Euconocephalus pallidus (Redtenbacher).

Conocephalus pallidus REDTENBACHER, Verh. zool.-bot. Ges. Wien 41 (1891) 383, 414.
Conocephaloides pallidus KIRBY, Syn. Cat. Orthoptera 2 (1906) 250.
Euconocephalus pallidus KARNY, General Insectorum fasc. 139 (1912) 35.

One testaceous female from Los Baños (Baker).

Further distribution.—India, Ceylon, Burma, Tonkin, Penang, Singapore, Java, Borneo.

Euconocephalus gracilis (Redtenbacher).

Conocephalus gracilis REDTENBACHER, Verh. zool.-bot. Ges. Wien 41 (1891) 383, 415.
Conocephaloides gracilis KIRBY, Syn. Cat. Orthoptera 2 (1906) 250.
Euconocephalus gracilis KARNY, Genera Insectorum fasc. 139 (1912) 35.

One greenish female from Los Baños (*Baker*).

Further distribution.—Penang, Java, Borneo, Caroline Islands, Yap, Pelew.

[1] Dodecas Conocephalidarum novarum, Verh. zool.-bot. Ges. Wien (1920) 21–23.

Euconocephalus insulanus (Redtenbacher). †

Conocephalus insulanus REDTENBACHER, Verh. zool.-bot. Ges. Wien. 41 (1891) 383, 416.
Conocephaloides insulanus KIRBY, Syn. Cat. Orthoptera 2 (1906) 250.
Euconocephalus insulanus KARNY, General Insectorum fasc. 139 (1912) 35.

One green female from Los Baños (*Baker*).
Further distribution.—Borneo, Singapore.

Homorocoryphus sp. (*dubius? interruptus?*).†

Only one green male from Los Baños (*Baker*). It is impossible to decide from the male only, whether it belongs to *dubius* or *interruptus*, because the principal difference between these two species is in the length of the ovipositor.
Distribution of dubius.—Japan.
Distribution of interruptus.—India, Japan.

CONOCEPHALINÆ = XIPHIDIINÆ

Teratura xiphidiosis Karny.* †

Teratura xiphidiopsis KARNY, Verh. zool.-bot. Ges. Wien (1920) 23.

One female from Mount Maquiling, Luzon (*Baker*).

Teratura simplex Karny.* †

Teratura simplex KARNY, Verh. zool.-bot. Ges. Wien (1920) 24.

One female from Mount Maquiling, Luzon (*Baker*).

Xiphidion longipenne (de Haan).

Locusta (*Xiphidium*) *longipennis* DE HAAN, Temminck, Verhand. Orthopt. (1842) 188, 189.
Xiphidium longipenne REDTENBACHER, Verh. zool.-bot. Ges. Wien. 41 (1891) 496, 512.
Anisoptera longipenne KIRBY, Syn. Cat. Orthoptera 2 (1906) 278.
Xiphidium (*Xiphidion*) *longipenne* KARNY, Abh. zool.-bot. Ges. Wien 4 (1907) 92.
Conocephalus (*Xiphidion*) *longipennis* KARNY, Genera Insectorum fasc. 135 (1912) 11.

One female from Los Baños (*Baker*).
Further distribution.—India, Ceylon, China, Cambodia, Cochinchina, Penang, Sumatra, Aru Islands.

Xiphidion bakeri Karny.* †

Xiphidion bakeri KARNY, Verh. zool.-bot. Ges. Wien (1920) 26.

One female from Los Baños (*Baker*).

Xiphidion affine Redtenbacher.

Xiphidium affine REDTENBACHER, Verh. zool.-bot. Ges. Wien 41 (1891) 497, 513.
Anisoptera affine KIRBY, Syn. Cat. Orthoptera 2 (1906) 278.
Xiphidium (*Xiphidion*) *affine* KARNY, Abh. zool.-bot. Ges. Wien 4 (1907) 92.
Conocephalus (*Xiphidion*) *affinis* KARNY, Genera Insectorum fasc. 135 (1912) 11.

One male and two females from Los Baños (*Baker*).
Further distribution—Fiji, Aru, Samoa.

Xiphidion maculatum Le Guillou.

Xiphidium maculatum LE GUILLOU, Rev. Mag. Zool. 4 (1841) 294.
Locusta (*Xiphidium*) *lepida* DE HAAN, Temminck, Verhand. Orth. (1842) 188, 189.
Xiphidium maculatum REDTENBACHER, Verh. zool.-bot. Ges. Wien 41 (1891) 497, 515.
Xiphidium maculatum JACOBSON and BIANCHI, Orthopt. Pseudoneur. Russ. (1903) 385.
Anisoptera maculatum KIRBY, Syn. Cat. Orthoptera 2 (1906) 278.
Xiphidium (*Xiphidion*) *maculatum* KARNY, Abh. zool.-bot. Ges. Wien 4 (1907) 93.
Conocephalus (*Xiphidion*) *maculatus* KARNY, Genera Insectorum fasc. 135 (1912) 11.

One female from Los Baños (*Baker*).
Further distribution.—Africa, Madagascar, India, Ceylon, Burma, Penang, Borneo, Celebes, Amoy, Java, Sumatra, Macassar, Malacca, Japan.

Conocephalus sannio Karny.* †

Conocephalus sannio KARNY, Verh. zool-bot. Ges. Wien (1920) 27.

One male and one female from Los Baños (*Baker*).

Bakerella signifrons Karny.* †

Bakerella signifrons KARNY, Verh. zool.-bot. Ges. Wien (1920) 29.

One female from Mount Maquiling (*Baker*).

LISTROSCELINÆ

Phisis philippinarum Karny.* †

Phisis philippinarum KARNY, Verh. zool.-bot. Ges. Wien (1920) 31.

One female from Los Baños (*Baker*).

Phisis pectinata (Guerin-Meneville).†

Listroscelis pectinata GUERIN-MENEVILLE, Voy. Coquille, Ins. (1830) 153.

Listroscelis pectinata SERVILLE, Hist. Nat. Ins. Orth. (1839) 398.
Listroscelis pectinata BURMEISTER, Handb. Ent. 2 (1839) 716.
Locusta pectinata DE HAAN, Temminck, Verhand. Orth. (1842) 216, 217.
Phisis pectinata STÅL, Freg. Eugenies Res. Ins. (1860) 324.
Listroscelis pectinata BRUNNER, Verh. zool.-bot. Ges. Wien 12 (1862) 92, 96.
Nocera pallida WALKER, Cat. Derm. Salt. Brit. Mus. 2 (1869) 101.
Nocera pectinata WALKER, Cat. Derm. Salt. Brit. Mus. 2 (1869) 214.
Teuthras pectinatus STÅL, Recensio Orthopt. 2 (1874) 116.
Teuthras pectinatus REDTENBACHER, Verh. zool.-bot. Ges. Wien 41 (1891) 540, 542.
Phisis pectinata KIRBY, Syn. Cat. Orthopt. 2 (1906) 286.
Phisis pectinata KARNY, Abh. zool.-bot. Ges. Wien 4 (1907) 104.
Teuthras pallidus HOLDHAUS, Denkschr. Akad. Wiss. Wien 68 (1908) 12, 22.
Phisis pallida KARNY, Genera Insectorum fasc. 131 (1912) 9.
Phisis pectinata KARNY, Genera Insectorum fasc. 131 (1912) 9.

A widely distributed species, diverging into several local races. One female from Mount Maquiling (*Baker*).

Further distribution.—Ceylon, Nicobar Islands, Borneo, Moluccas, Bouru, New Guinea, Tahiti, Samoa.

Hexacentrus spiniger Karny.* †

Hexacentrus spiniger KARNY, Verh. zool.-bot. Ges. Wien (1920) 32.

One female from Mount Maquiling (*Baker*).

Hexacentrus unicolor Serville.

Hexacentrus unicolor SERVILLE, Ann. Sci. Nat. 22 (1831) 146.
Locusta unicolor SERVILLE, Hist. Nat. Ins. Orthopt. (1839) 531.
Hexacentrus unicolor BURMEISTER, Handb. Entom. 2 (1839) 714.
Hexacentrus plantaris BURMEISTER, Handb. Entom. 2 (1839) 714.
Locusta plantaris DE HAAN, Temminck, Verhand. Orth. (1842) 215, 216.
Hexacentrus unicolor REDTENBACHER, Verh. zool.-bot. Ges. Wien (1891) 548, 552.
Hexacentrus unicolor KIRBY, Syn. Cat. Orthopt. 2 (1906) 287.
Hexacentrus unicolor KARNY, Abh. zool.-bot. Ges. Wien 4 (1907) 108.
Hexacentrus unicolor KARNY, Genera Insectorum fasc. 131 (1912) 16.

One male from Los Baños (*Baker*) and one female from Mount Maquiling (*Baker*).

Further distribution.—India, Burma, Singapore, Amoy, Java, Sumatra, Celebes, Amboina, Borneo, Moluccas, Cochinchina, China, Formosa, Japan.

PSEUDOPHYLLINÆ

Togona unicolor Matsumura and Shiraki.†

Togona unicolor MATSUMURA and SHIRAKI, Journ. Coll. Agric. Sapporo 3 (1908) 30; KARNY, Suppl. Entom. 4 (1915) 74.

One male from Los Baños (*Baker*).
Further distribution.—Formosa.

Phyllomimus detersus (Walker).

Pseudophyllus detersus WALKER, Cat. Derm. Salt. Brit. Mus. 2 (1869) 406.
Pseudophyllus sinensis WALKER, Cat. Derm. Salt. Brit. Mus. 2 (1869) 406.
Phyllomimus granulosus STÅL, Oefv. Vet.-Akad. Förh. 30 (1873) 48.
Phyllomimus granulosus STÅL, Recensio Orthopt. 2 (1874) 69.
Phyllomimus truncatifolia PICTET and SAUSSURE, Icon. Saut. Vertes (1894) 19.
Phyllomimus granulosus BRUNNER, Monogr. Pseudophyll. (1895) 54, 55.
Phyllomimus detersus KIRBY, Syn. Cat. Orthopt. 2 (1906) 299.

One female from Los Baños (*Baker*).
Further distribution.—China, Java, Celebes, Moluccas.

Phyllomimus bakeri sp. nov.* †

Olive green. Antennæ yellowish, not annulated. Hind margin of pronotum rounded; lateral lobes with the lower margin nearly straight. Elytra near the apex narrowed, at apex rounded; their posterior margin nearly straight. Radial area without darker spots. Radial veins diverging at the middle of elytra, with the principal branch not undulated. Hind wings perfectly developed, not shorter than elytra. Anterior and middle femora beneath on both margins 7 to 9 denticulated; the anterior ones in female a little longer than the pronotum. Posterior femora on the inner side without a blood red stripe, beneath on both margins about 12 denticulated, with the basal denticles smaller than the distal ones. Supra-anal lamina of female longer than broad, at apex roundly pointed. Ovipositor rather narrow, with the superior margin slightly sinuated and serrulated. Subgenital lamina of female obtuse triangular, emarginated at apex.

Measurements of female.

	mm.
Length of body	36.5
Length of pronotum	7.3
Length of elytra	55.7
Breadth of elytra	13.3
Length of fore femora	9.6
Length of hind femora	18.7
Length of ovipositor	19.0
Breadth of ovipositor	3.4

I take pleasure in naming this species in honor of Prof. Charles Fuller Baker, who discovered it in the Philippine Islands.

One female from Mount Maquiling (*Baker*).

This new species is very closely related to *Ph. detersus*, but may be distinguished by its slenderer body, the distinctly longer elytra, and the formation of the ovipositor. The measurements given by Brunner[2] seem to be the same in *detersus* as in *bakeri*, but an accurate comparison of my new species with the examples of *detersus* in Brunner's collection (Vienna) shows that the ovipositor of *bakeri* is relatively longer and slenderer than in *detersus*. The breadth at base, indeed, is the same, but in *bakeri* the ovipositor is distinctly narrowed quite from the base, in *detersus* the breadth is nearly the same to the middle and only the apical half is distinctly narrowed.

MECOPODINÆ

Mecopoda elongata (Linnæus).

Gryllus (*Tettigonia*) *elongatus* LINNÆUS, Syst. Nat. ed. 10 1 (1758) 429.
Gryllus (*Tettigonia*) *elongatus* LINNÆUS, Mus. Ludov. Ulric. (1764) 127.
Gryllus javanus JOHANSSON, Amoen. Acad. 6 (1763) 398.
Locusta elongata FABRICIUS, Syst. Ent. (1775) 284.
Gryllus (*Tettigonia*) *ferruginea* STOLL, Spectress, Saut. (1813) 13.
Gryllus (*Tettigonia*) *rufa* STOLL, Spectress, Saut. (1813) 13.
Conocephalus elongatus THUNBERG, Mem. Acad. Petersb. 5 (1815) 279.
Locusta longipes THUNBERG, Mem. Acad. Petersb. 5 (1815) 280.
Locusta scalaris THUNBERG, Mem. Acad. Petersb. 5 (1815) 282.
Mecopoda maculata SERVILLE, Ann. Sci. Nat. 31 (1831) 155.
Mecopoda virens BRULLE, Hist. Nat. Ins. 9 (1835) 140.
Mecopoda virens SERVILLE, Hist. Nat. Ins. Orth. (1839) 533.
Mecopoda elongata BURMEISTER, Hand. Ent. 2 (1839) 685.
Mecopoda ferruginea BLANCHARD, Hist. Nat. Ins. 3 (1840) 12.
Mecopoda virens BLANCHARD, Hist. Nat. Ins. 3 (1840) 12.
Locusta (*Mecopoda*) *javana* DE HAAN, Temminck, Verhand. Orth. (1842) 187.
Locusta (*Mecopoda*) *macassariensis* DE HAAN, Temminck, Verhand. Orth. (1842) 188.
Locusta (*Mecopoda*) *niponensis* DE HAAN, Temminck, Verhand. Orth. (1842) 188.
Decticus pallidus WALKER, Cat. Derm. Salt. Brit. Mus. 2 (1869) 262.
Decticus tenebrosus WALKER, Cat. Derm. Salt. Brit. Mus. 2 (1869) 262.
Lucera bicoloripes WALKER, Cat. Derm. Salt. Brit. Mus. 2 (1869) 265.
Mecopoda rufa WALKER, Cat. Derm. Salt. Brit. Mus. 3 (1870) 458.
Mecopoda elongata REDTENBACHER, Verh. zool.-bot. Ges. Wien 42 (1892) 212, 214.

[2] Monogr. Pseudophyll. (1895) 55.

Mecopoda elongata TANI, Ins. World 9 (1905) pl. 6.
Mecopoda elongata KIRBY, Cat. Orth. 2 (1906) 364.
Mecopoda elongata CAUDELL, Genera Insectorum fasc. 171 (1916) 24.

One dark grayish brown female from Mount Maquiling (*Baker*), with blackish legs and lateral lobes of pronotum; elytra with rounded black spots in the precostal and costal areas, and with larger, triangular ones between the radial and medial veins. Medial vein of hind wings with 5 branches (f. *macassariensis* de Haan).

One pale green male with shorter tegmina and wings, from Los Baños (*Baker*). Eyes and the upper part of lateral lobes of pronotum dark brown. Legs brownish, the hind ones with a darker stripe on the outer side. Tegmina green without dark spots, only the tympanum brown. Medial vein of hind wings with 4 branches (f. *niponensis* de Haan).

Further distribution of the species.—China, Japan, India, Ceylon, Malacca, Sunda Islands, Aru, Key, Moluccas, Australia.

PHANEROPTERINÆ

Mirollia carinata (de Haan).

Locusta (*Phylloptera*) *carinata* DE HAAN, Temminck, Verhand. Orth. (1842) 196, 199.
Phaneroptera carinata STÅL, Freg. Eugenies Res., Orth. (1860) 321.
Mirollia carinata STÅL, Recensio Orthopt. 2 (1874) 27.
Mirollia carinata BRUNNER, Monogr. Phaneropt. (1878) 107.
Mirollia carinata DOHRN, Stettin. Entom. Zeit. 53 (1892) 66.
Mirollia carinata KIRBY, Syn. Cat. Orthopt. 2 (1906) 398.

One female from Mount Maquiling (*Baker*).
Further distribution.—Java.

Ducetia thymifolia (Fabricius).

Locusta thymifolia FABRICIUS, Syst. Entom. (1775) 283.
Locusta japonica THUNBERG, Mem. Acad. Peters. 5 (1815) 282.
Locusta (*Phaneroptera*) *quinquenervis* DE HAAN, Temminck, Verhand. Orth. (1842) 191, 193.
Phaneroptera neochlora WALKER, Cat. Derm. Salt. Brit. Mus. 2 (1869) 342.
Phaneroptera privata WALKER, Cat. Derm. Salt. Brit. Mus. 2 (1869) 344.
Ducetia japonica STÅL, Recensio Orthopt. 2 (1874) 26.
Ducetia japonica BRUNNER, Monogr. Phaneropt. (1878) 109, 110.
Ducetia japonica BRUNNER, Verh. zool.-bot. Ges. Wien 41 (1891) 53.
Ducetia japonica JACOBSON and BIANCHI, Orthopt. Pseudoneur. Russ. (1902–3) 336, 374.
Ducetia thymifolia KIRBY, Syn. Cat. Orthopt. 2 (1906) 398.

One green male from Mount Maquiling (*Baker*) and two orange yellow females, one from Los Baños (*Baker*) and one from Paete (*Baker*).

Further distribution.—India, Ceylon, Cambodia, Japan, Java, Borneo, Australia.

Casigneta spinicauda sp. nov.* †

Pale green. Vertex conical, deeply sulcate, with slightly diverging lateral carinæ. Radial vein of tegmina brown at base. Ovipositor sickle-shaped, strongly compressed, pointed at apex, with the upper margin almost entirely serrulated, the lower margin only in the distal third. Subgenital lamina of female in the middle part elongated-oval, transversely truncate at apex; on both sides laterally an acute, spiniform process.

Measurements of female.

	mm.
Length of pronotum	5.5
Length of elytra	36.6
Breadth of elytra	7.0
Length of front femora	9.5
Length of hind femora	26.0
Length of ovipositor	8.0

One female from Mount Maquiling (*Baker*).

This very interesting species is distinguished from the hitherto known *Casigneta* at once by the sharply pointed processes on the sides of subgenital lamina (female). Such processes are wanting in *cochleata* Brunner [3] and *pellucida* Brunner.[4] In *cochleata* the subgenital lamina of the female is triangular, transversely truncated at apex, in *pellucida* elongated-triangular, pointed. Of *lamellosa* Brunner [5] only the male is known. That *loliifolia* [6] does not belong to this genus, I have already shown elsewhere. By its whole appearance and the shorter ovipositor, *Casigneta spinicauda* most nearly approaches *C. pellucida,* but the formation of subgenital lamina (female) is a very characteristic one.

Phaula teretiuscula sp. nov.* †

Yellowish green. Of smaller size. Disk of pronotum rounded, smooth, its front part compressed. Elytra a little broader than the length of pronotum; radial vein with 3 or 4 not furcated branches, running into the hind margin. Anterior

[3] Monogr. Phaneropt. (1878) 164.
[4] Op. cit., 165.
[5] Verh. zool.-bot. Ges. Wien 41 (1891) 77.
[6] De Haan, Temminck, Verhand. Orthopt. (1842) 191, 194.

and middle femora with the front margin spined. Hind femora on the outer margin with 9 to 11, on the inner one with 8 or 9 spines. Fore and middle tibiæ sulcated above. The outer tympanum open, the inner one obtected. Ovipositor sickle-shaped, pointed at apex, with the margins in the distal part slightly serrulated. Subgenital lamina (female) triangular.

Measurements of female.

	mm.
Length of body	17.3
Length of pronotum	4.5
Length of elytra	31.0
Breadth of elytra	7.0
Length of fore femora	6.0
Length of hind femora	20.0
Length of ovipositor	9.6

One female from Los Baños (*Baker*).

This species approaches *Phaula rugulosa* Brunner [7] by its whole habitus, building of tegmina, and form of lateral lobes of pronotum but is distinguished from it by the entirely smooth pronotum, which agrees with *Ph. laevis* Brunner [8] and *compressa* Brunner.[9] From *lævis*, it may be separated by the considerably narrower elytra, from *compressa* by its less compressed pronotum and the slenderer ovipositor. The subgenital lamina of female is not emarginated as in *rugulosa*, but triangular and more acuminated than in *compressa*.

Phaula phaneropteroides Brunner.

Phaula phaneropteroides BRUNNER, Verh. zool.-bot. Ges. Wien 41 (1891) 79, 81; KIRBY, Syn. Cat. Orthopt. 2 (1906) 426.

One greenish male from Los Baños (*Baker*). Known only from the Philippine Islands.

Holochlora javanica Brunner.†

Locusta (*Phaneroptera*) *japonica* DE HAAN, Temminck, Verhandel. Orth. (1842) 191, 194 (nec Thunberg, 1815).
Holochlora javanica BRUNNER, Monogr. Phaneropt. (1878) 175, 180.
Holochlora javanica BRUNNER, Verh. zool.-bot. Ges. Wien 41 (1891) 90, 91.
Holochlora javanica KIRBY, Syn. Cat. Orthopt. 2 (1906) 431.

One female from Los Baños (*Baker*).

Further distribution.—Java, Sumatra; farther India.

[7] Monogr. Phaneropt. (1878) 167.
[8] Op. cit., 168.
[9] Verh. zool.-bot. Ges. Wien 41 (1891) 79, 81.

Liotrachela lobata Brunner.

Liotrachela lobata BRUNNER, Verh. zool.-bot. Ges. Wien 41 (1891) 93; KIRBY, Syn. Cat. Orthopt. 2 (1906) 432.

One green specimen from Mount Maquiling (*Baker*). Known only from the Philippine Islands.

Phaneroptera subcarinata Bolivar.†

Phaneroptera subcarinata BOLIVAR, Ann. Soc. Ent. France 68 (1900) 746; KIRBY, Syn. Cat. Orthopt. 2 (1906) 436.

One greenish yellow male from Los Baños (Baker) agrees perfectly with this Indian species (after Bolivar's description), but the elytra reach the hind knees in repose. They are almost coriaceous, with slightly prominent secondary veins. Their marginal area is of the same color as the other parts of elytra and equally reticulated. Fore coxæ armed with a distinct spine. The end of male abdomen is distinctly different from the following species and is well described by Bolivar. It agrees very well with the African *Ph. nana*. Brunner's collection (at Vienna) possesses *subcarinata* under the name "nana" from several places in the Indo-malayan region.

Further distribution.—India.

Phaneroptera furcifera Stål.

Phaneroptera furcifera STÅL, Recensio Orthopt. 2 (1874) 29; BRUNNER, Monogr. Phaneropt. (1878) 210, 216; KIRBY, Syn. Cat. Orthopt. 2 (1906) 436.

Two green females with red-veined hind wings from Los Baños (*Baker*). This species forms with *brevis* Serville (syn. *gracilis* Burmeister 1839 nec. Germar 1817) a peculiar group, diverging from the other *Phaneropteras* by the exceedingly long subgenital lamina of the male and by the lack of spines on fore coxae. Brunner has placed the genus *Phaneroptera* in the group with fore-coxal spines (as they are present in the other species) and has not mentioned that in *furcifera* and *brevis* this spine is quite rudimentary or entirely wanting, but in his collection he has declared it on the labels. Therefore Brunner's table of genera leads, in the determination of these two species, never to *Phaneroptera*, but to *Pyrrhicia* (*Letana*). But the texture of the tegmina is totally different in these two genera and places *furcifera* and *brevis* in the genus *Phaneroptera*. Further, the ovipositor is considerably shorter than in *Letana despecta*, and the hind wings are distinctly longer. The hind femora distinctly surpass the elytra in *furcifera*, in *brevis* not or scarcely at all.

Phaneroptera furcifera has been recorded only from the Philippine Islands.

Furnia bakeri sp. nov.* †

Green. Fastigium of the vertex narrow, nearly as broad as the first antennal joint, deeply sulcated with the frontal fastigium almost contiguous. Disk of pronotum rather flat; lateral lobes roundly inserted, higher than long. Tegmina nearly transparent, linear; their first radial branch in the distal part furcated, the second simple. Hind wings distinctly exceeding the elytra. Fore femora slightly sulcated beneath, armed with a few very small spines on the front margin. Middle femora in the distal half of outer margin finely spined. Hind femora with spines on both margins. Anal segment of female in the middle distinctly emarginate, on each side with sharply triangular projection. Ovipositor nearly twice as long as the pronotum, broadest after the middle, sickel-shaped, pointed at apex; its lower margin in the distal half crenulated. Subgenital lamina of female shorter and broader than in *F. incerta;* rounded at apex.

Measurements of female.

	mm.
Length of body	24.3
Length of pronotum	6.0
Length of elytra	39.5
Breadth of elytra	9.0
Length of fore femora	7.4
Length of hind femora	35.5
Length of ovipositor	11.5

I have named this new species in honor of its discoverer, Charles Fuller Baker.

One female from Mount Maquiling (*Baker*).

This species agrees by its whole habitus rather with *F. incerta* Brunner [10] but is a little larger. By the formation of vertex, the new species approaches *F. exotica* Brunner,[11] but differs by its larger size, its more regular venation of elytra, and its more extended hind wings. The *exotica* female is unknown. In *incerta* (female) the anal segment is only slightly emarginated, without projections; and the subgenital lamina are longer and slenderer than in *F. bakeri,* being a little emarginated at the extreme apex.

[10] Monogr. Phaneropt. (1878) 296. [11] Op. cit., 286.